# Journal OF THE AMERICAN DIETETIC ASSOCIATION

VOL. 25, NO. 1 JANUARY 1949

RECENT REVISIONS IN THE RECOMMENDED DIETARY ALLOWANCES
*P. C. Jeans*, M.D.

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*L. A. Maynard*, Ph.D., D.Sc.

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Increasing the "Invisible Milk" in the Daily Food Intake

***A.D.A. Annual Meeting, Denver, October 10-14, 1949***

*Published by* THE AMERICAN DIETETIC ASSOCIATION

PUBLISHING OFFICE: MOUNT ROYAL AND GUILFORD AVENUES, BALTIMORE 2, MARYLAND
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VOLUME 25
NUMBER 1

# Journal OF THE American Dietetic Association

*Publishing Office*
Mt. Royal and Guilford Aves.
Baltimore 2, Md.

American Dietetic Association
620 N. Michigan Ave., Chicago 11 Ill.

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The Journal of the American Dietetic Association is published monthly by the American Dietetic Association, Mt. Royal & Guilford Aves., Baltimore 2, Md., and 620 N. Michigan Ave., Chicago 11, Ill. Neither the Association nor the Editor assumes responsibility for the opinions expressed by authors of papers abstracted, quoted, or published in full in this Journal.

*Subscriptions:* Rate $5 per year. Special rate to undergraduate students and dietetic interns, $1.50 per year, if order is approved by head of the department. Single copies 75 cents. All correspondence concerning Journal subscriptions, orders for copies or reprints from the Journal, and notices of change of address should be sent to the American Dietetic Association, Mt. Royal & Guilford Aves., Baltimore 2, Md., or 620 N. Michigan Ave., Chicago 11, Ill. Notices regarding change of address should reach the publisher two weeks before the date of issue on which the change is to take effect and both old and new addresses should be given.

*Editorial Correspondence:* All articles and notices for publication, general correspondence, and inquiries should be sent to the Editor at the American Dietetic Association, 620 N. Michigan Ave., Chicago 11, Ill. Manuscripts are accepted for publication on condition that they are contributed solely to the Journal. Copy must be double-spaced and original, not carbon, submitted.

*Advertising:* All correspondence concerning advertising should be addressed to the American Dietetic Association, 620 N. Michigan Ave., Chicago 11, Ill.

COPYRIGHT, 1949, BY THE AMERICAN DIETETIC ASSOCIATION Printed in U.S.A.
Entered as second-class matter June 30, 1925 at the Post Office at Baltimore, Md., under the act of August 24, 1912
Published Monthly by The American Dietetic Association

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# Recent Revisions in the Recommended Dietary Allowances[1]

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THE RECOMMENDED Dietary Allowances of the National Research Council were first formulated in 1941 and published in 1943 (1). It has been the purpose of the Food and Nutrition Board and the National Research Council to keep the recommendations under practically constant review, with republication of the Allowances at intervals as indicated. A revision appeared in 1945. A second revision has now been published.

The committee responsible for the present revision had as its chairman Dr. H. C. Sherman. Work on the present revision was started early in 1947. Thus it required more than a year to gather and review the evidence and formulate final judgments. It was a task industriously undertaken and seriously carried out. The recommendations of the committee were submitted to the Food and Nutrition Board and were adopted by the Board with few minor changes.

While the changes in the Table are relatively few and in general may be considered as minor, all of the nutrients were reviewed carefully, and the explanatory text accompanying the Table has been extensively revised. The text now includes a discussion of folic acid and of vitamin K, nutrients not included in the former texts. No new categories have been added to the Table.

The goal of the Allowances has remained the same, namely, that they be suitable for maintenance of good nutrition over long periods of time. They are intended to be enough higher than the average minimum requirements of the average person to cover most of the individual variations in the requirements of normal persons, as well as to cover additional benefits to be derived from certain nutrients when taken above the critical level. Thus the Allowances are generally higher than the average minimum requirements. They are separated from the minimum requirements by no special formula. The margins above the requirements are wider for some nutrients than for others. The levels recommended are such that, in the judgment of the Food and Nutrition Board, any amounts substantially lower would not be expected to give equally good results with large numbers of persons over long periods.

No change was made in the allowances for protein, iron, vitamin A, and ascorbic acid, although each was reviewed. The changes made for other nutrients will be discussed briefly.

### CALORIC RECOMMENDATIONS

The several changes in caloric allowances represent downward revisions with one exception. The allowance for infants at six months of age was increased from 100 to 110 calories for each kilogram of body weight. The latter value represents more closely the energy intake when babies are growing well. The caloric allowance was decreased by 100 calories for each of the following categories; sedentary men and women; moderately active women; and women in the latter half of pregnancy. The allowance for active men was decreased in effect by increasing the designated energy expenditure while the values were left the same. "Moderately active" was changed to "Physically active," and "Very active" was changed to "With heavy work."

It is pointed out in the text that the values of the Table represent group averages and that the proper allowance is that which, over an extended period, will maintain body weight or rate of growth at a level most conducive to well-being. It is suggested that the Allowances be regarded as subject to modification of plus or minus 15 to 20 per cent. Thus the caloric allowances can be only rough guides.

### CALCIUM REVISION

While most of the revisions of the Table are downward, the calcium allowance recommended for adults was increased from 0.8 to 1.0 gm. daily. This new value has a broader basis in experimental data than was available for the 1945 revision in that new data (2–6) were available for review along with the

[1] Presented at the 31st Annual Meeting of the American Dietetic Association in Boston, on October 20, 1948.

RECOMMENDED DAILY DIETARY ALLOWANCES*†
*Revised 1948*
Food and Nutrition Board, National Research Council

| | CALORIES[1] | PROTEIN | CALCIUM | IRON | VITAMIN A[2] | THIAMINE[3] | RIBOFLAVIN[3] | NIACIN (Nicotinic acid)[3] | ASCORBIC ACID | VITAMIN D |
|---|---|---|---|---|---|---|---|---|---|---|
| | | *gm.* | *gm.* | *mg.* | *I.U.* | *mg.* | *mg.* | *mg.* | *mg.* | *I.U.* |
| Man (154 lb., 70 kg.) | | | | | | | | | | |
| Sedentary | *2400* | 70 | *1.0* | 12[4] | 5000 | 1.2 | *1.8* | 12 | 75 | [5] |
| *Physically active* | 3000 | 70 | *1.0* | 12[4] | 5000 | 1.5 | *1.8* | 15 | 75 | [5] |
| *With heavy work* | 4500 | 70 | *1.0* | 12[4] | 5000 | *1.8* | *1.8* | *18* | 75 | [5] |
| Woman (123 lb., 56 kg.) | | | | | | | | | | |
| Sedentary | *2000* | 60 | *1.0* | 12 | 5000 | *1.0* | 1.5 | *10* | 70 | [5] |
| Moderately active | *2400* | 60 | *1.0* | 12 | 5000 | 1.2 | *1.5* | 12 | 70 | [5] |
| Very active | 3000 | 60 | *1.0* | 12 | 5000 | 1.5 | *1.5* | 15 | 70 | [5] |
| Pregnancy (latter half) | *2400*[6] | 85 | 1.5 | 15 | 6000 | *1.5* | 2.5 | *15* | 100 | *400* |
| Lactation | 3000 | 100 | 2.0 | 15 | 8000 | *1.5* | 3.0 | *15* | 150 | *400* |
| Children up to 12 yrs.[7] | | | | | | | | | | |
| Under 1 yr.[8] | *110*/2.2 lb. (1 kg.) | 3.5/2.2 lb. (1 kg.) | 1.0 | 6 | 1500 | 0.4 | 0.6 | 4 | 30 | *400* |
| 1–3 yrs. (27 lb., 12 kg.) | 1200 | 40 | 1.0 | 7 | 2000 | 0.6 | 0.9 | 6 | 35 | 400 |
| 4–6 yrs. (42 lb., 19 kg.) | 1600 | 50 | 1.0 | 8 | 2500 | 0.8 | 1.2 | 8 | 50 | 400 |
| 7–9 yrs. (58 lb., 26 kg.) | 2000 | 60 | 1.0 | 10 | 3500 | 1.0 | 1.5 | 10 | 60 | 400 |
| 10–12 yrs. (78 lb., 35 kg.) | 2500 | 70 | 1.2 | 12 | 4500 | 1.2 | 1.8 | 12 | 75 | 400 |
| Children over 12 yrs.[7] | | | | | | | | | | |
| Girls | | | | | | | | | | |
| 13–15 yrs. (108 lb., 49 kg.) | 2600 | 80 | 1.3 | 15 | 5000 | 1.3 | 2.0 | 13 | 80 | 400 |
| 16–20 yrs. (122 lb., 55 kg.) | 2400 | 75 | 1.0 | 15 | 5000 | 1.2 | 1.8 | 12 | 80 | 400 |
| Boys | | | | | | | | | | |
| 13–15 yrs. (108 lb., 49 kg.) | 3200 | 85 | 1.4 | 15 | 5000 | 1.5 | 2.0 | 15 | 90 | 400 |
| 16–20 yrs. (141 lb., 64 kg.) | 3800 | 100 | 1.4 | 15 | 5000 | *1.7* | 2.5 | *17* | 100 | 400 |

* From: Recommended Dietary Allowances, Revised. National Research Council Reprint and Circ. Series, No. 129, 1948. Italicized figures represent changes from the 1945 Revised Recommended Dietary Allowances.

† Objectives toward which to aim in planning practical dietaries: The recommended allowances can be attained with a good variety of common foods which will also provide other minerals and vitamins for which requirements are less well known.

[1] Calorie allowances must be adjusted up or down to meet specific needs. The calorie values in the table are therefore not applicable to all individuals but rather represent group averages. The proper calorie allowance is that which over an extended period will maintain body weight or rate of growth at the level most conducive to well-being.

[2] The allowance depends on the relative amounts of vitamin A and carotene. The allowances of the table are based on the premise that approximately two-thirds of the vitamin A value of the average diet in this country is contributed by carotene and that carotene has half or less than half the value of vitamin A.

[3] For adults (except pregnant and lactating women) receiving diets supplying 2000 calories or less, such as reducing diets, the allowances of thiamine and niacin may be 1 mg. and 10 mg. respectively. The fact that figures are given for different calorie levels for thiamine and niacin does not imply that we can estimate the requirement of these factors within 500 calories, but they are added merely for simplicity of calculation. In the present revision, riboflavin allowances are based on body weight rather than caloric levels. Other members of the B complex also are required, though no values can be given. Foods supplying adequate thiamine, riboflavin, and niacin will tend to supply sufficient of the remaining B vitamins.

[4] There is evidence that the male adult needs relatively little iron. The need will usually be provided for if the diet is satisfactory in other respects.

[5] The need for supplemental vitamin D by vigorous adults leading a normal life seems to be minimum. For persons working at night and for nuns and others whose habits shield them from the sunlight, as well as for elderly persons, the ingestion of small amounts of vitamin D is desirable.

[6] During the latter part of pregnancy the calorie allowance should increase approximately 20 per cent above the preceding level. The value of 2400 calories represents the allowance for pregnant, sedentary women.

[7] Allowances for children are based on the needs for the middle year in each group (as 2, 5, 8, etc.) and are for moderate activity and for average weight at the middle year of the age group.

[8] Needs for infants increase from month to month with size and activity. The amounts given are for approximately 6 to 8 months. The dietary requirements for some of the nutrients such as protein and calcium are less if derived largely from human milk.

FURTHER RECOMMENDATIONS ACCOMPANYING RECOMMENDED DAILY DIETARY ALLOWANCES

*Revised 1948*

*Fat.* There is available little information concerning the human requirement for fat. Fat allowances must be based at present more on food habits than on physiological requirements. While a requirement for certain unsaturated fatty acids (the linoleic and arachidonic acids of natural fats) has been amply demonstrated with experimental animals, the human needs for these same fatty acids is not known. In spite of the paucity of information on this subject, there are several factors which make it desirable (1) that fat be included in the diet to the extent of at least 20 to 25 per cent of the total calories and (2) that the fat intake include essential unsaturated fatty acids to the extent of at least 1 per cent of the total calories. At higher levels of caloric expenditure, e.g., for a very active person consuming 4500 calories and for children and for adolescent persons, it is desirable that 30 to 35 per cent of the total calories be derived from fat. Since foodstuffs such as meat, milk, cheese, nuts, etc., contribute fat to the diet, it is necessary to use separated or "visible" fats such as butter, oleomargarine, lard, or shortenings to supply only one-third to one-half the amounts indicated.

*Water.* A suitable allowance of water for adults is 2.5 liters daily in most instances. An ordinary standard for diverse persons is 1 milliliter for each calorie of food. Most of this quantity is contained in prepared foods. At work or in hot weather, requirements may reach 5 to 13 liters daily. Water should be allowed *ad libitum*, since sensations of thirst usually serve as adequate guides to intake except for infants and sick persons.

*Salt.* The needs for salt and for water are closely interrelated. A liberal allowance of sodium chloride for the adult is 5 grams daily, except for some persons who sweat profusely. The average normal intake of salt is 10 to 15 grams daily, an amount which meets the salt requirements for a water intake up to 4 liters daily. When sweating is excessive, one additional gram of salt should be consumed for each liter of water in excess of 4 liters daily. With heavy work or in hot climates 20 to 30 grams daily may be consumed with meals and in drinking water. Even then, most persons do not need more salt than usually occurs in prepared foods. It has been shown that after acclimatization, persons produce sweat that contains only about 0.5 gram to the liter in contrast with a content of 2 to 3 grams for sweat of the unacclimatized person. Consequently after acclimatization, need for increase of salt beyond that of ordinary food disappears.

*Iodine.* The requirement for iodine is small, probably about 0.002 to 0.004 mg. daily for each kilogram of body weight, or a total of 0.15 to 0.30 mg. daily for the adult. This need is met by the regular use of iodized salt; its use is especially important in *adolescence* and *pregnancy*.

*Phosphorus.* Available evidence indicates that the phosphorus allowances should be at least equal to those for calcium in the diets of children and of women during the latter part of pregnancy and during lactation. In the case of other adults, the phosphorus allowances should be approximately 1.5 times those for calcium. In general it is safe to assume that if the calcium and protein needs are met through common foods, the phosphorus requirement also will be covered, because the common foods richest in calcium and protein are also the best sources of phosphorus.

*Copper.* The requirement for copper for adults is about 1 to 2 mg. daily. Infants and children require approximately 0.05 mg. for each kilogram of body weight. The requirement for copper is approximately one-tenth that for iron. A good diet normally will supply sufficient copper.

*Vitamin K.* The requirement for vitamin K usually is satisfied by any good diet except for the infant in utero and for the first few days after birth. Supplemental vitamin K is recommended during the last month of pregnancy. When it has not been given in this manner, it is recommended for the mother preceding delivery or for the baby immediately after birth.

*Folic Acid.* Evidence for recognizing folic acid (pteroylglutamic acid, vitamin $B_c$, *L. casei* factor, or vitamin M) as an essential human nutrient is presented in the text. The quantitative requirement cannot be closely estimated from evidence now available.

older. It is recognized that not all persons need 1 gm. daily. A fairly wide range exists in the ability of normal persons to utilize calcium. Studies of older persons show that poor utilization is relatively common; they have shown also that osteoporosis is common as evidence of calcium deficiency. On the basis of the evidence reviewed, it was concluded that the 1-gm. allowance covers the need of all but one in a hundred of the adult population. It was concluded also that while people can adjust to less, they are not so well off over long periods of time.

THIAMINE ALLOWANCE

Some difficulty was encountered in the revision of the allowances for thiamine, because the evidence is somewhat conflicting and difficult to evaluate. The evidence available for the 1945 revision was reviewed together with the newer data. On the basis of the evidence, the minimum requirement for the adult was considered to be 0.23 mg. or more for each 1000 calories (7–14). Recognition was given to the fact that requirements differ with different persons and with the type of diet, and that thiamine is one of several nutrients of which the body stores are never large and are exhausted early by disease and other stresses. It was believed desirable that stores of thiamine be maintained. In view of the various factors considered, it was decided to provide as a factor of safety an allowance of approximately 100 per cent more than the lower of the reported minimum requirements. Thus the value of 0.5 mg for each 1000 calories, the same as in the 1945 revision, was accepted as a safe allowance at ordinary low levels of caloric intake. Also, as in the 1945 revision, the thiamine intake of the adult should not fall below 1 mg. daily even though the caloric intake may be reduced drastically. The only revision made in the 1948 allowances is that when the caloric intake exceeds 3000 calories, the allowance should be increased 0.2 mg. for each 1000 calories above the 3000-calorie level. This value for the 1945 revision was 0.3 mg.

### RIBOFLAVIN REQUIREMENT

In the Allowances prior to 1948 it had been assumed that the riboflavin requirement, like that of thiamine, increases with the energy intake. While the evidence for stating a desirable allowance for riboflavin is still meager, it now seems clear that the requirement does not vary with the calories or with activity, but that it varies more closely with the size of the body.

Clinical evidences of riboflavin deficiency are slow to appear even with extreme deprivation. Observations depending on the appearance of mild deficiency states require long experimental periods. Such prolonged human studies are lacking. The best evidence available at present is that which concerns amounts of riboflavin that prevent tissue depletion as determined by load tests. Thus for the present it is desirable to consider as the minimum requirement the least amount that will prevent tissue depletion. For adults this amount has been shown to be approximately 20 mcg. daily for each kilogram of body weight (8, 15–17), or 1.4 and 1.1 mg. respectively for the 70-kg. man and the 56-kg. woman. An allowance somewhat greater than this is recommended for several reasons. One is that a margin of safety above the minimum requirement is desirable. Another is that in experiments with animals, the best long-term results show a need for considerably larger amounts than those which meet the apparent requirements of relatively short-term studies. On this basis the recommendation is 1.8 and 1.5 mg. respectively for the 70-kg. man and the 56-kg. woman. This acceptance of single levels without regard to calories or activity represents a recognition of new data and is a severe departure from earlier reports of the Board.

The riboflavin allowances for pregnancy and lactation have not been decreased along with those for other adults. The allowance for the latter part of pregnancy remains at 2.5 mg. because of the desirability of high standards during this stress period. The allowance for lactation remains at 3 mg. A need for a generous increase over the allowance for other women is obvious. The average riboflavin content of human milk is none too high.

No change has been made in the riboflavin allowance for children, largely because of lack of information. The recommendations for adults are based on data obtained with adults. While it may seem reasonable that children have the same requirements proportionately as do adults, observational data are too meager to make this certain. Not enough information is available to warrant a decrease in the formerly assigned values.

### NIACIN CHANGES

In the original Table of Allowances the recommendation for niacin was ten times that for thiamine. This value was based on observations with animals, since no studies of human beings were available. Few data for human beings are available now. One study using a marginal diet containing corn products indicated a minimum requirement of 7.5 mg. daily. By calculation, the preventive diets of Goldberger contained 5 mg. These values are roughly ten times the minimum thiamine requirement. Thus some basis exists for maintaining this ratio. It is now known that the niacin requirement is closely related to the intake of tryptophan. It seemed to the Board unwise to change the allowances for niacin until more is known of the amino acid content of diets. It is believed that no difficulty will be encountered with intakes of niacin lower than the allowances if a high level of good quality protein is ingested. A case particularly in point is the allowance of 4 mg. daily for babies. The average diet of infants does not contain this amount, but this amount is undoubtedly available to the baby through synthesis and because of the high-protein intake. The growing child needs both tryptophan and niacin for production of new tissue. The only changes in the recommendations for niacin are those which make the values parallel with the changes in thiamine.

### RECOMMENDATIONS FOR VITAMIN D

The chief range in the allowance for vitamin D is the elimination of the range of 400 to 800 I.U. given for certain categories. It was concluded that the value of 400 I.U. is ample. It has been shown for babies in particular that maximum calcium retention is attained with 400 I.U. daily and that with 800 I.U. the retention is no greater (18–21). In the text some concern is expressed for those adults who work at night, for nuns, and others whose habits shield them from sunlight, as well as for elderly persons. For these it is believed that ingestion of small amounts of vitamin D is desirable.

### FOLIC ACID RECOGNIZED

In the current revision of the Allowances, folic acid is given recognition as an essential nutrient by means of discussion in the text that accompanies the Table. Information concerning the requirement is still too meager to permit inclusion of specific values in the Table. Therapeutic response in human beings with macrocytic anemia has been obtained with amounts as low as 0.1 mg. a day. Studies with monkeys and poultry indicate a probable human requirement of from 0.1 to 0.2 mg. daily.

### VITAMIN K

Vitamin K is represented in the Table only by a footnote, as formerly. In the discussion in the text, however, a relatively new concept of its function is given recognition. Any good diet supplies vitamin K or its precursors for bacterial synthesis in an amount adequate to maintain the prothrombin level in the blood at a normal level.

This statement applies to all categories except for one critical period. While pregnant women may get enough vitamin K to supply their own needs, it often happens that the supply is not enough to satisfy the needs of the fetus. Babies often are born with low prothrombin levels. Vitamin K given to the mother before the end of pregnancy is quickly reflected in the prothrombin content of the baby.

The newer concept relates to the effect of vitamin K deficiency in producing lesions in the central nervous system of babies. Experimental observations with chicks and infant rats have shown that a deficiency of vitamin K produces vascular and parenchymal lesions in the brain. Clinical observations with human subjects indicate that the same type of lesions may occur in babies (22–24). More studies with human beings are needed. The lesions are such that hemorrhage may occur spontaneously before, during, or after birth or from moderate trauma at birth. It is possible that many so-called "birth injuries" are caused by the lesions incident to vitamin K deficiency.

For this reason it is suggested that vitamin K be given to the mother for at least one month before the birth of the baby. It is well known that vitamin K given to the mother immediately preceding the birth of the baby or to the baby soon after birth results promptly in good prothrombin levels in the baby. Treatment at this time, however, cannot be expected to correct so promptly the vascular and parenchymal lesions that may already have occurred.

In conclusion, it is to be emphasized again that these Allowances are not in any way a yardstick of requirements. They are definitely above the average requirements and in some instances they are twice the minimum requirement. In addition to meeting the average needs, they are intended to cover the needs of those normal persons who have less efficient utilization. They are intended to insure good nutrition of populations and may serve as buying and feeding guides. Persons ingesting less than the Allowances are not deficient *ipso facto*. Those who ingest the amounts of nutrients recommended can be considered to be obtaining ample amounts. Even then, one must consider the possibility of failure of utilization in some instances.

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# Translating Dietary Allowances into Foods and Diets[1]

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ARITHMETICAL calculation, from data in food tables, of a diet which will meet the Recommended Dietary Allowances is simple. The actual provision of such a diet in terms of foods which are locally available, acceptable, and within the range of the consumer's income or of an institutional budget is frequently quite a different matter. This is the practical situation with which the nutritionist and dietitian must deal. Here lie problems of food supply and food evaluation which will be discussed in this paper.

It is the job of education to convince people of the importance of good nutrition and to teach them how to achieve it. If this education is to be effective, there must be a food supply for the individual which is nutritionally adequate, which he likes, and which he can afford to buy.

Thus, as a broad objective in the translation of the Recommended Dietary Allowances into diets, consideration must be given as to how an appropriate food supply can be made available. Here problems of production, processing, and distribution arise with which the nutrition scientist should be concerned in the interest of better nutrition and health. Consumers' needs should guide food policies and practices all along the line from production to the table.

The nutritionist and dietitian are well qualified to interpret these needs to the agencies and industries concerned. In so doing they can perform a basic and much needed service to the cause of nutrition, for in this way they can influence the kinds and forms of food available as well as the selection of diet.

## NATIONAL FOOD SUPPLIES OF CALCIUM-CONTAINING FOODS

The situation created by the increased recommended allowance for calcium for adults (1) is such a case. Clearly, previous recommendations as to diets and meals must be altered if the new figure is to be met. It is a simple solution on paper to include more milk and leafy vegetables. Such a solution would also provide other needed improvements in the diets of many people. In practice, however, the solution is not so simple. The cost of milk is a matter of real concern to many families and institutions. The food habits of many adults must be changed. In many localities the milk supply has been inadequate, at least seasonally, to meet the needs indicated by the previous allowance. Similarly, there are practical problems to overcome in stepping up the consumption of green leafy vegetables.

Of more basic concern is the fact that the national supplies of the calcium-containing foods are inadequate, even in this period of high food production, to provide everyone with his full allowance. This fact is brought out in Table 1 which shows the estimated per capita supply of edible nutrients at the retail level and the per capita needs according to the newly revised Recommended Dietary Allowances as compiled by the Department of Agriculture.

Since edible nutrients available at the retail level are subject to further losses in home storage and preparation and at the table, the total supply must be greater accordingly than the amount corresponding to a full allowance for everyone. Such is the case for all nutrients (see last column, Table 1), *except* calcium. Without discussing the question of whether the excesses of the other nutrients are too low or unnecessarily high, it is clear that the overall supply of calcium is inadequate, even assuming equality of distribution, which does not occur.

### *Water as a Source of Calcium*

One source of calcium which is not considered in the above, nor usually in making diets as far as I am aware, is the water supply. Geological survey data (2) show that there are many cities and presumably the surrounding localities where the water supplies a significant amount of calcium. Though the data are inadequate, they suggest that in six states 0.1 gm. or more is supplied daily in this way, on the average, assuming a water intake of four to

[1] Presented at the 31st Annual Meeting of the American Dietetic Association in Boston, on October 20, 1948.

six glasses. In fact, a few localities are reported where the water intake would thus supply over a third of the daily need. Thus, there appear to be

TABLE 1

*Estimated 1948 needs and available supplies of nutrients in the United States on a per capita basis*

| NUTRIENT | AVAILABLE SUPPLY PER CAPITA PER DAY* | NEEDS PER CAPITA PER DAY† | AVAILABLE SUPPLY COMPARED TO REQUIREMENTS |
|---|---|---|---|
| | | | % |
| Calories | 3330. | 2610. | 127 |
| Protein (gm.) | 95. | 65. | 146 |
| *Calcium* (gm.) | *1.06* | *1.03* | *100* |
| Iron (mg.) | 17.7 | 11.7 | 151 |
| Vitamin A (I.U.) | 8500. | 4600. | 185 |
| Thiamine (mg.) | 2.12 | 1.25 | 170 |
| Riboflavin (mg.) | 2.41 | 1.64 | 147 |
| Niacin (mg.) | 20.1 | 12.5 | 161 |
| Ascorbic acid (mg.) | 128. | 71. | 181 |

* Figures taken from "The National Food Situation," July–September, 1948, published by the U. S. Department of Agriculture.

† Data supplied by Dr. Esther Phipard, Bureau of Human Nutrition and Home Economics, U. S. Department of Agriculture.

situations where it would be of practical importance to take account of this source of calcium. For most areas studied, however, the contribution made by the water supply is negligible. The data suggest that over 90 per cent of our population get less than 0.1 gm. a day from this source and that for our population as a whole the average is only half of this amount.

Clearly, from the standpoint of the national food supply, calcium has become our "No. 1" problem under the newly revised Recommended Dietary Allowances. The most desirable solution, particularly because it also contributes several other needed nutrients, is a larger milk supply. We should certainly continue to work to that end. This solution cannot be expected immediately, and specifically not next year, in the face of declining numbers of dairy cows, although with favorable price relationships, some further increase in production per cow is possible.

The situation should stimulate us to renewed efforts to get into the human diet more of the skim milk now wasted or inefficiently used. This involves no problem of agricultural production, but one of recovery, industrial cooperation, marketing, and consumer education. In certain areas, some progress along this line has already been made. You are all aware of the difficulties and the conflicting interests involved.

In some ways it is surprising that with all of the interest—in fact, pressure—regarding the fortification of foods with certain nutrients, particularly vitamins, there seems to be no interest in fortification with calcium. Experiments have shown that the calcium salts are readily utilized by man. They are cheap. Calcium is an optional ingredient in the enrichment of flour and bread. But so far as I know, it has never been added in this country, and there is commercial opposition to making its inclusion compulsory as has been done with other ingredients used for enrichment purposes.

It seems to me that in the light of the present situation, these various possibilities of getting more calcium into our food supply need renewed consideration. The Food and Nutrition Board is giving them active attention. An effective stimulus could come from those most directly concerned with the problem of making diets which will meet the new allowances.

## PROBLEM OF REGIONAL DISTRIBUTION OF FOOD SUPPLIES

While, first of all, the national supply must be sufficient, good nutrition depends on an adequate supply and consumption at the local and individual level. There is clear evidence that malnutrition exists in certain segments of our population despite apparently fully adequate supplies of most nutrients on a national basis, as shown in Table 1. Such supplies simply indicate that there is enough for everyone, but provide no assurance as to their distribution in accordance with need. Many people customarily consume more than they require. There must, therefore, be enough left to provide adequately for the others.

There are many localities where, at least seasonally, an adequate diet of acceptable foods is simply not available for all. This is true of the milk supply with which we are particularly concerned in view of the increased recommended allowance for calcium. In certain areas production and marketing measures for increasing the milk supply particularly need consideration, along with the alternative measures previously discussed.

There are at times regional and local shortages of other nutrients. By recognizing that there are many different ways of getting an adequate diet, much more can be done to expand the supply and use of acceptable, reasonably priced foods of high nutritive value which are most readily obtainable in the community. Translation of allowances into diets should be concerned with the production and marketing problems involved in these situations. The dietitian who has some understanding of these problems can play a larger and more effective role accordingly for the improvement of nutrition.

## PROBLEM OF LOW INCOMES

The ever-present problem of those people whose incomes do not enable them to buy an adequate and

acceptable diet, even if available, needs more active attention. It is argued that consumer income has increased with food costs. Although many have not participated in this income rise, all must eat.

While the use of public funds for the care of the sick is generally accepted, their use to prevent ill health by providing an adequate diet for those who cannot otherwise obtain it is widely opposed. Public funds have been extensively used through price supports and parity payments to insure an adequate food supply during recent years. It would seem reasonable that some attention should also be given to insuring that the health benefits obtainable from the food thus produced are actually realized.

The revised allowances recognize the desirability of somewhat lower caloric intakes for the adult, particularly with advancing age. Since most of the allowances for nutrients have remained the same and that for calcium has been substantially increased, diets planned for adults must be accordingly more concentrated in nutrients. Thus, in many situations, dietitians face a more difficult problem, particularly where cost is important.

## AVENUES FOR OBTAINING A BETTER FOOD SUPPLY

These facts lend emphasis to the general need, in the interest of dietary improvement in many situations, of a food supply of higher nutritional quality. This can be accomplished by providing more of the superior foods, such as milk. It can also be brought about through improvements in the nutritional quality of many foods as now produced, processed, and marketed. The possibility of greatly stepping up this quality in certain foods of plant origin by breeding and selection has been demonstrated. Similarly, advances have been made in the conservation of nutrients in processing. There must be a public demand for these improvements if significant dietary contributions are to be made. Dietitians can do much in stimulating this demand and in increasing its influence on production, processing, and marketing operations accordingly.

In fact, unless the importance of nutritional quality is continually stressed by those most concerned, this quality may actually become poorer with changing production, processing, and marketing practices, as has frequently been the case in the past. We now know that the development of hybrid corn, which has resulted in a large increase in yield, has also resulted in a lower protein content. As another example, there is the recent study of Holmes and co-workers (3) showing that spraying of tomatoes with hormones increased the yield and the percentage of seedless fruit, but also caused a drop of 21 per cent in ascorbic acid content.

The modern practices of marketing which are enlarging the year-round available supply of fresh fruits and vegetables are an aid to better nutrition. At the same time, certain harvesting, shipping, and storage practices tend to lower the nutritional quality of the produce. Unfortunately, market quality is measured largely by appearance rather than by nutritive value. For example, spraying a leafy vegetable with water will prevent it from wilting and maintain its fresh appearance in the market after most of its vitamin value has been lost.

## NUTRITIONAL STANDARDS FOR FOODS

These various considerations raise the question as to the possibility of establishing nutritional standards for certain foods, for many products have little relation to nutritive value. The difficulties involved in formulating objective and useful nutritional standards are many. The idea may be impracticable of accomplishment. But even its consideration would help by focusing attention on an important problem.

In the interest of higher nutritional quality, the desirability of the further fortification of foods with minerals, vitamins, and amino acids deserves consideration. Any such step, however, should be approved only if it is clearly in the interest of better nutrition and health, all things considered. There must be assurance that the possible benefit will actually reach those most needing it. Decisions should not be influenced by pressures from those interested in marketing the products concerned.

In this paper questions have been discussed which are well known to all dietitians, and few solutions have been offered. The purpose of the paper, rather, is to draw attention to problems of food supply which must be taken into account for the more effective translation of recommendations into practice and, thus, into better nutrition and health. I believe that some understanding of these problems and of the steps needed for their solution is as important in serving the interests of better nutrition as the knowledge of what the body needs and why. The members of the Food and Nutrition Board, as well as many other nutrition scientists throughout the country, recognize this fact as is evident from their activities.

I believe that those who are daily concerned with the actual problems of feeding people can be particularly effective in stimulating the interest of agriculture and the food industry in providing the kinds and amounts of food which are needed to make good nutrition possible for all.

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# Influence of Various Levels of Thiamine Intake on Physiologic Response[1]

## III. Reaction Time

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LITTLE information relative to the effect of low-thiamine intake on reaction time can be found in the literature. In the studies reported, either the diets were deficient in the B-complex or the reactions involved were not simple in nature. Recently, Brozek *et al.* (1) reported an experiment including reaction time in which groups of men were fed a diet containing various amounts of thiamine ranging from 0.199 mg. to 0.574 mg. per 1000 calories. During a period of 168 days no significant changes in reaction times were reported. Later on in their experiment Brozek and co-workers reduced the thiamine intake of a group of ten men to 0.050 mg. per day, continuing the experiment from fifteen to twenty-seven days, depending on the individual resistance to the dietary stress. With this amount of thiamine, there was a significant lengthening of toe reaction time and in reaction time involving the whole body. Johnson and his co-workers (2) reported that men doing hard muscular work on low-thiamine intakes were unable to perform fast movements, although reaction time was not studied as such.

It is believed by some investigators that results attributed to low-thiamine diets are frequently masked by factors other than the low-thiamine intake. An acceptable low-thiamine diet must meet the requirements of any good diet, if it is to yield unmasked thiamine deficiency results. This means that the food served must be of sufficient variety to avoid monotony. Also, the food must be tasty and served in a sightly manner. In addition, the diet must be adequate in all respects except thiamine. The test of an acceptable supplemented low-thiamine diet is the absence of psychologic reactions against it, the maintenance of body weight, and a feeling of well-being commensurate with that to which the individual is accustomed. These requirements cannot be met in a diet which is practically thiamine free. With this idea in mind, an attempt was made to construct an acceptable diet which contained less thiamine than the lowest amount generally recognized as adequate to avoid symptoms of deficiency.

This report is a summary of an investigation covering a two-year period. It was divided into four parts, arbitrarily called "Experiment 1," "Control Period," "Experiment 2," and "Experiment 3." Experiment 1, covering the first year, was devoted to the construction of the diet and the development and validation of techniques. The second year's work included the Control Period, Experiment 2, and Experiment 3, in which the effect of five levels of thiamine intake on reaction time was studied.

### EXPERIMENT 1

#### *Diet Construction*

As a starting point, the thiamine content of a large number of foodstuffs was determined, and cooking and handling methods which were destructive to thiamine were studied. To determine the edibility and monotony of the low-thiamine diets, they were fed to eight subjects for various lengths of time during the course of nine months. The subjects were healthy women varying in age from twenty-one to thirty-eight years, who were actively engaged in class work at the State University of Iowa.

All foods were served in the University Hospital dining room, under the strict supervision of the Department of Nutrition. Observations indicated that the subjects required approximately 2200 calories per day to satisfy their desire for food and to maintain their body weight. Nine meals were provided three times per day, the ninth being analyzed for its thiamine content. Urine specimens were analyzed, not only as a check on the thiamine content

[1] This work was generously supported by a research grant from General Mills, Inc., Minneapolis. Received for publication August 10, 1948.

of the diet, but also to see if the subjects were eating food containing thiamine other than that prescribed. Analysis was done by a modification of the thiocrome method described by Hennessy and Cerecedo (3) in conjunction with a Coleman model 12A fluorometer.

### *Reaction Time Technique*

Reaction time is defined as the interval elapsing between the appearance of a stimulus and the response to it. In this experiment the stimulus was a light, and the response was made by pressing an acrosnap switch with the index finger. Time was recorded in milliseconds by means of a Dunlap chronoscope, specially adapted to the problem at hand. Electric circuits were arranged so that simultaneously with the flash of the light, the chronoscope hand was started. The chronoscope hand was stopped when the subject closed the switch with the index finger. The subjects were alone in a dark room provided with a dim red light.

Before each experiment the subject was given time for dark adaptation. She also performed several practice trials so as to assure proper adjustment to the apparatus. Each subject performed twenty-five responses four times. A rest period, during which the subject moved about the laboratory, was provided between each group of responses. The experiment was performed on a rigid schedule, and the conditions were constant. The first fifty responses were used to determine average reaction time. This number of responses was proved to be sufficient since a correlation of the odd with the even numbered responses showed that additional data failed to improve the correlation significantly. One hundred responses were recorded to provide additional data for studying more adequately the distribution of scores.

### *Results*

As a result of the work during Experiment 1, it was found possible to provide menus which contained not more than 140 mcg. thiamine per day and which were quite acceptable to the subjects. This level was selected for the basal diet in Experiment 2. A detailed discussion of the selection and preparation of foods, menus, and recipes has been presented elsewhere (4). Also, a technique was perfected by which reaction time could be measured with confidence.

## CONTROL PERIOD

In the second year of the investigation, twelve women, ranging in age from twenty to thirty-five years, served as subjects. They were normal healthy individuals as attested by the fact that thorough physical examinations were negative in all respects. All fell within the normal range of body-build type. The weight range of the subjects was 120 to 140 lb., and individual variations in weight did not exceed 2 lb. throughout the entire thirty-two weeks of the Control and Experiments 1 and 2.

During the thirty-two weeks, the subjects lived together in a nurses' residence and ate all of their food in the University Hospital dining room under the supervision of the Department of Nutrition. Two proctors were assigned to the group, not to dictate behavior, but to observe it. Thirteen meals were provided three times a day, the thirteenth being analyzed for thiamine. Specimens of urine were analyzed as previously described (5).

The actual experimental periods were preceded by a control period of approximately eight weeks, during which all subjects ate a diet adequate in all respects. This diet provided approximately 1200 mcg. thiamine. During this time, data on reaction time were collected eight times from all subjects. Two records were taken during each of the first two weeks, and once each week thereafter. Thus norms for reaction time were established during this period for all subjects. Each score used in calculating norms was the average of fifty responses per subject. The first three records were charged off as practice, so that the norms were based on averages acquired during the last four and a half weeks of the period.

## EXPERIMENT 2

Experiment 2 was conducted during the forty-five days immediately following the Control Period. The living and eating situations of the subjects remained unchanged. The subjects were divided into two groups of six each, one of which served as the control group, the other as the experimental group.

During Experiment 2 the six control subjects ate a basal diet containing 140 mcg. thiamine per day, approximately 2500 calories, and 60 gm. protein. In addition, they received a supplement of 1200 mcg. thiamine, which brought their daily intake of thiamine up to approximately 1340 mcg.

The six experimental subjects ate the basal diet containing 140 mcg. thiamine and were given placebos.

This plan made it possible for each subject to serve as her own control. It was also advantageous because the subjects had no way of knowing how much thiamine they were receiving, since they all ate exactly the same diet and took what appeared to be the same supplement.

Data on reaction time were collected seven times from all twelve subjects during the forty-five days of Experiment 2. Records were taken weekly with the exception of the last week when data were collected twice. It is reasonable to assume that any effect which the low-thiamine diet produced would be more pronounced during the last week than during the preceding weeks. For this reason, only the data collected during the last (sixth) week of Experiment 2 were used for the determination of differences and their significance.

*Results*

The data on reaction time collected from the six control subjects are shown in Table 1. A comparison of the mean for each subject for the control period with that for Experiment 2 shows that, except in the case of Subject *9*, there was no significant difference in reaction times for the two periods. Subject *9* showed a significant increase in reaction time even though she was receiving adequate thiamine. On the basis of observation and objective tests, Subject *9* was below her established standard of physical efficiency during the last two weeks of Experiment 2. This may account for her increase in reaction time during this period.

The average daily amount of thiamine eaten by the control subjects during Experiment 2 and the average daily thiamine output in the urine have been reported (5).

The data on reaction time collected from the six subjects on low-thiamine intake are shown in Table 2. A comparison of the mean for each subject for the control period with that for Experiment 2 shows that in all subjects the reaction time responses during the low-thiamine period were longer than during the Control Period. In two subjects the difference was significant only at the 10 per cent level of confidence.

When the control and experimental means for experimental subjects (140 mcg. thiamine intake daily) were averaged and compared with a like grouping of scores for the control group, receiving 1340 mcg. thiamine daily during Experiment 2, the difference between the means was significant to the 1 per cent level of confidence. Thus a true difference in behavior was established between the experimental and control groups.

Another difference between the control and experimental groups was demonstrated in the dispersion of the frequency distribution of the data. This is shown in Figure 1. To compare the frequency distribution of data during the control and experimental periods, cumulative group frequency distributions were compiled for the last testing (Record No. 15) and one selected at random from the control period (Record No. 5). In Figure 1A are shown the cumulative frequency distributions of reaction times for the control group and in Figure 1B are seen similar data for the experimental group. It is evident

TABLE 1

*Comparison of reaction times for the* control *subjects during both the Control Period and Experiment 2 (when they ate approximately 1340 mcg. thiamine daily). The data are averages of fifty trials per subject.*

| RECORD NUMBER | REACTION TIME | | | | | |
|---|---|---|---|---|---|---|
| | Subject 7 | Subject 8 | Subject 9 | Subject 10 | Subject 11 | Subject 12 |
| Control Period—Adequate Thiamine Intake | | | | | | |
| | *seconds* | *seconds* | *seconds* | *seconds* | *seconds* | *seconds* |
| 4 | 0.269 | 0.248 | 0.225 | 0.247 | 0.319 | 0.229 |
| 5 | 0.265 | 0.232 | 0.240 | 0.255 | 0.293 | 0.224 |
| 6 | 0.277 | 0.265 | 0.234 | 0.251 | 0.288 | 0.233 |
| 7 | 0.271 | 0.236 | 0.232 | 0.268 | 0.295 | 0.258 |
| 8 | 0.276 | 0.242 | 0.233 | 0.253 | 0.300 | 0.227 |
| Mean | 0.272 | 0.245 | 0.233 | 0.255 | 0.299 | 0.234 |
| Standard deviation | 0.004 | 0.011 | 0.005 | 0.007 | 0.011 | 0.012 |
| Experiment 2—1340 mcg. Thiamine Daily | | | | | | |
| 14 | 0.274 | 0.251 | 0.254 | 0.266 | 0.289 | 0.230 |
| 15 | 0.285 | 0.247 | 0.249 | 0.259 | 0.272 | 0.254 |
| Mean | 0.279 | 0.249 | 0.252 | 0.263 | 0.281 | 0.242 |
| Standard deviation | 0.006 | 0.002 | 0.003 | 0.004 | 0.009 | 0.012 |
| Statistical Data | | | | | | |
| t | 1.49 | 0.41 | 4.29 | 1.29 | 1.78 | 0.66 |
| Significance level | 20% | 70% | 1% | 30% | 20% | 60% |

TABLE 2

*Comparison of reaction times for six* experimental *subjects during the Control Period and Experiment 2 (when they ate approximately 140 mcg. thiamine daily). The data are averages of fifty trials per subject.*

| RECORD NUMBER | REACTION TIME | | | | | |
|---|---|---|---|---|---|---|
| | Subject 1 | Subject 2 | Subject 3 | Subject 4 | Subject 5 | Subject 6 |
| Control Period—Adequate Thiamine Intake | | | | | | |
| | *seconds* | *seconds* | *seconds* | *seconds* | *seconds* | *seconds* |
| 4 | 0.266 | 0.268 | 0.278 | 0.238 | 0.216 | 0.250 |
| 5 | 0.267 | 0.259 | 0.262 | 0.232 | 0.216 | 0.240 |
| 6 | 0.259 | 0.272 | 0.287 | 0.224 | 0.216 | 0.232 |
| 7 | 0.268 | 0.248 | 0.268 | 0.223 | 0.225 | 0.231 |
| 8 | 0.286 | 0.254 | 0.262 | 0.232 | 0.215 | 0.239 |
| Mean | 0.269 | 0.260 | 0.271 | 0.230 | 0.218 | 0.238 |
| Standard deviation | 0.009 | 0.009 | 0.009 | 0.006 | 0.004 | 0.007 |
| Experiment 2—140 mcg. Thiamine Daily | | | | | | |
| 14 | 0.291 | 0.299 | 0.281 | 0.256 | 0.231 | 0.245 |
| 15 | 0.292 | 0.278 | 0.307 | 0.266 | 0.239 | 0.262 |
| Mean | 0.292 | 0.289 | 0.294 | 0.261 | 0.235 | 0.254 |
| Standard deviation | 0.001 | 0.011 | 0.013 | 0.005 | 0.004 | 0.009 |
| Statistical Data | | | | | | |
| t | 3.06 | 3.15 | 2.15 | 5.74 | 4.47 | 2.19 |
| Significance level | 5% | 5% | 10% | 1% | 1% | 10% |

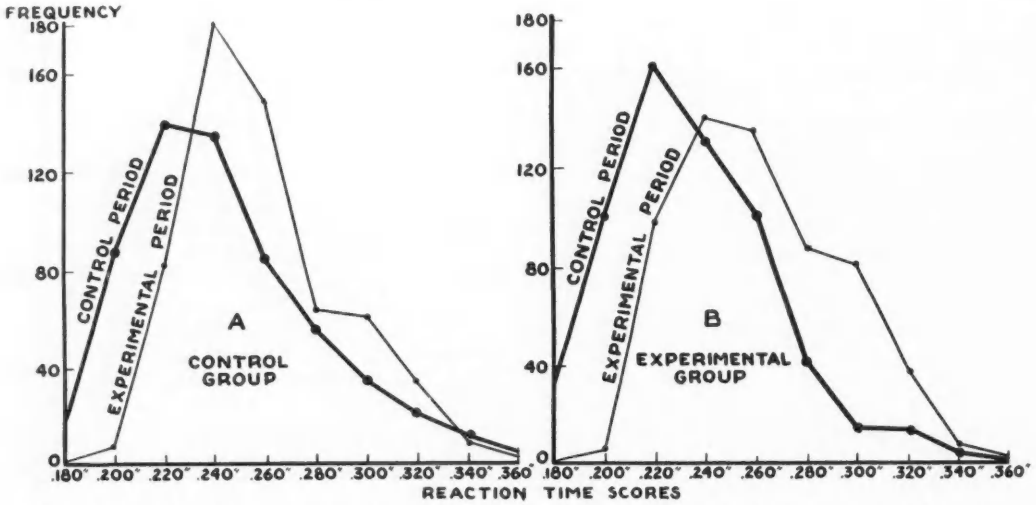


FIG. 1. *Comparison of the frequency distributions of reaction time scores for control and experimental subjects during a control period and experimental period in which experimental subjects received only 140 mcg. thiamine daily.*

that the distribution of the scores made by the control group during the Control Period has a greater spread and less pronounced peak than during the experimental period. This greater concentration of scores around the mean was due to practice and is significant at the 1 per cent level of confidence. In the case of the experimental group (Fig. 1B), instead of an increased concentration of scores around the mean, they became more scattered. This effect is believed to be due to a lack of thiamine in the diet, since the scores became more scattered in spite of any practice effects.

## EXPERIMENT 3

### *Method*

This experiment was devised (a) to give further information relative to the minimum thiamine requirement, (b) to study the relationship in regard to time between the amount of thiamine eaten and the development of changes in reaction time, and (c) to investigate the idea that there is an individual tolerance to low-thiamine diets. To this end, diets were constructed which contained three different levels of thiamine between the limits of those studied in Experiment 2. These levels were set arbitrarily at 200 mcg., 625 mcg., and 1000 mcg. daily. The details of the preparation and content of these diets have been presented elsewhere (4).

The diet containing 200 mcg. thiamine per day was considered the basal diet for Experiment 3. The other two thiamine levels were obtained by supplementing the basal diet. All subjects required approximately 2500 calories per day to satisfy them and to maintain their body weight. The diet procedure was as follows: (a) four subjects ate the basal diet containing approximately 200 mcg. thiamine per day; (b) three subjects ate the basal diet supplemented with 425 mcg. thiamine, making a total intake of approximately 625 mcg. per day, and (c) three subjects ate the basal diet supplemented with 800 mcg. thiamine, making a total intake of approximately 1000 mcg. per day.

The subjects in Experiment 3 were the same as those who participated in Experiment 2, except that Subjects *4* and *10* withdrew early in the experiment because of symptoms of appendicitis. Since seventeen days had elapsed between experiments, during which time all subjects were eating an adequate diet, and since a large dose of thiamine was administered to all at the close of Experiment 2, it was hoped that deficiency effects would have been rectified. Perhaps the ideal situation would have been to use subjects who had been on adequate thiamine for a longer time previous to the beginning of Experiment 3, but the situation demanded that the same subjects be used at that time. However, there was a distinct advantage in using these subjects because they were trained in reaction time techniques as well as in eating prescribed diets. To further control any residual deficiency effects, subjects were rotated, i.e., those who were eating adequate thiamine in Experiment 2 were placed on the lowest level of thiamine intake in Experiment 3 and vice versa. The group eating the intermediate level (625 mcg.) of thiamine, of necessity, was heterogeneous with respect to previous thiamine intake.

The experimental procedure and comparisons of data were similar to those employed in Experiment 2. Subjects were maintained at their respective levels of thiamine intake for a period of nineteen weeks and data were collected weekly at equally spaced intervals. Data gathered during the Control Period of

approximately eight weeks preceding Experiment 2 were compared with the mean reaction times of subjects during the fifth and sixth weeks of Experiment 3 (the time interval, which corresponds to that used in Experiment 2) which will be referred to as Phase A, and the eighteenth and nineteenth weeks (Phase B).

### *Results*

*The 200-Mcg. Level of Thiamine Intake.* The data on reaction time collected from the same subjects relative to reaction time for the control period, for the fifth and sixth weeks, and for the eighteenth and nineteenth weeks of Experiment 3 are shown in Tables 3 and 6. When the records for Phase A are compared with the scores for the Control Period, it is seen that Subjects *7* and *9* became slower, Subject *8* showed no change, and Subject *11* showed improvement. A comparison of the averages for the eighteenth and nineteenth weeks (Phase B) with the control averages shows that in the interim two of the subjects improved to some extent. Nevertheless, Subjects *7* and *9* remain significantly slower in reaction time than during the Control Period, Subject *11* continued to improve, and Subject *8* tended to improve.

*The 625-Mcg. Level of Thiamine Intake.* The data on reaction time for the group on this intake are shown in Tables 4 and 6. Comparisons of control and experimental scores for both Phase A and Phase B show no significant differences. The data on reaction time collected at the end of the experimental period showed a marked similarity to those taken during the Control Period while the subjects were on an adequate unsupplemented diet.

*The 1000-Mcg. Level of Thiamine Intake.* The data relative to reaction time for the three subjects maintained at 1000-mcg. level of thiamine intake are

TABLE 3

*Comparison of the reaction times of four subjects during the Control Period and during Phases A and B of Experiment 3 (when diet contained not more than 200 mcg. thiamine per day). The data are averages of fifty trials per subject.*

| RECORD NUMBER | REACTION TIME | | | |
|---|---|---|---|---|
| | Subject 7 | Subject 8 | Subject 9 | Subject 11 |
| Control Period—1200 mcg. Thiamine Daily | | | | |
| | *seconds* | *seconds* | *seconds* | *seconds* |
| 4 | 0.269 | 0.248 | 0.225 | 0.319 |
| 5 | 0.265 | 0.232 | 0.240 | 0.293 |
| 6 | 0.277 | 0.265 | 0.234 | 0.288 |
| 7 | 0.271 | 0.236 | 0.232 | 0.295 |
| 8 | 0.276 | 0.242 | 0.233 | 0.300 |
| Mean | 0.272 | 0.245 | 0.233 | 0.299 |
| Standard deviation | 0.004 | 0.011 | 0.005 | 0.012 |
| Phase A, Experiment 3—200 mcg. Thiamine Daily | | | | |
| 5 | 0.295 | 0.241 | 0.240 | 0.278 |
| 6 | 0.296 | 0.248 | 0.248 | 0.265 |
| Mean | 0.296 | 0.245 | 0.244 | 0.272 |
| Standard deviation | 0.001 | 0.003 | 0.004 | 0.007 |
| Phase B, Experiment 3—200 mcg. Thiamine Daily | | | | |
| 18 | 0.289 | 0.230 | 0.266 | 0.265 |
| 19 | 0.289 | 0.237 | 0.252 | 0.267 |
| Mean | 0.289 | 0.234 | 0.259 | 0.266 |
| Standard deviation | 0.000 | 0.003 | 0.007 | 0.001 |
| Statistical Data | | | | |
| t (control period vs. Phase A) | 6.49 | 0.00 | 2.39 | 2.81 |
| Significance level | 1% | — | 10% | 5% |
| t (control period vs. Phase B) | 4.59 | 1.12 | 4.74 | 3.67 |
| Significance level | 1% | 40% | 1% | 2% |

TABLE 4

*Comparison of the reaction times of three subjects during Control Period and during Phases A and B of Experiment 3 (when diet contained not more than 625 mcg. thiamine per day). The data are averages of fifty trials per subject.*

| RECORD NUMBER | REACTION TIME | | |
|---|---|---|---|
| | Subject 5 | Subject 6 | Subject 12 |
| Control Period—1200 mcg. Thiamine Daily | | | |
| | *seconds* | *seconds* | *seconds* |
| 4 | 0.216 | 0.250 | 0.229 |
| 5 | 0.216 | 0.240 | 0.224 |
| 6 | 0.216 | 0.232 | 0.233 |
| 7 | 0.225 | 0.231 | 0.258 |
| 8 | 0.215 | 0.239 | 0.227 |
| Mean | 0.218 | 0.238 | 0.234 |
| Standard deviation | 0.004 | 0.007 | 0.012 |
| Phase A, Experiment 3—625 mcg. Thiamine Daily | | | |
| 5 | 0.216 | 0.242 | 0.236 |
| 6 | 0.206 | 0.236 | 0.233 |
| Mean | 0.211 | 0.239 | 0.235 |
| Standard deviation | 0.005 | 0.003 | 0.001 |
| Phase B, Experiment 3—625 mcg. Thiamine Daily | | | |
| 18 | 0.220 | 0.235 | 0.255 |
| 19 | 0.220 | 0.238 | 0.233 |
| Mean | 0.220 | 0.237 | 0.244 |
| Standard deviation | 0.000 | 0.002 | 0.011 |
| Statistical Data | | | |
| t (control period vs. Phase A) | 1.71 | 0.20 | 0.09 |
| Significance level | 20% | 90% | 90% |
| t (control period vs. Phase B) | 0.61 | 0.17 | 0.83 |
| Significance level | 60% | 90% | 50% |

shown in Tables 5 and 6. During the fifth and sixth weeks (Phase A), one major change was seen which was significant at the 10 per cent level. At the eighteenth and nineteenth weeks two subjects showed differences which were significant at the 10 per cent level. Closer examination of these means reveals that at the fifth and sixth weeks all subjects tended to have longer reaction times than during the control period, while at the eighteenth and nineteenth weeks the subjects as a group tended to have shorter reaction times. These tendencies suggest that the time between Experiments 2 and 3 was too short to nullify completely the effects of the previous experiment for the subjects who had been on a low-thiamine diet.

A study of the dispersion of scores for reaction time of subjects eating the 200-mcg. diet and the 1000-mcg. diet was made. This comparison was based on records No. 5 and 19 for reaction time and parallels that made of the scores of the subjects eating the 140-mcg. diet and the 1340-mcg. diet. The results were strikingly similar. The scores for reaction time of the group receiving an adequate intake (1000 mcg. thiamine daily) became more concentrated around the mean as the experiment progressed. The difference was significant at the 1 per cent level when the F test was applied to the variances. The scores of those eating the 200-mcg. diet became more dispersed under a like comparison.

TABLE 5

*Comparison of the reaction times of three subjects during the Control Period and during Phases A and B of Experiment 3 (when the diet contained not more than 1000 mcg. thiamine per day). The data are averages of fifty trials per subject.*

| RECORD NUMBER | REACTION TIME | | |
|---|---|---|---|
| | Subject 1 | Subject 2 | Subject 3 |
| Control Period—1200 mcg. Thiamine Daily | | | |
| | *seconds* | *seconds* | *seconds* |
| 4 | 0.266 | 0.268 | 0.278 |
| 5 | 0.267 | 0.259 | 0.262 |
| 6 | 0.259 | 0.272 | 0.287 |
| 7 | 0.268 | 0.248 | 0.268 |
| 8 | 0.286 | 0.254 | 0.262 |
| Mean | 0.269 | 0.260 | 0.271 |
| Standard deviation | 0.009 | 0.009 | 0.010 |
| Phase A, Experiment 3—1000 mcg. Thiamine Daily | | | |
| 5 | 0.293 | 0.261 | 0.289 |
| 6 | 0.278 | 0.276 | 0.281 |
| Mean | 0.286 | 0.269 | 0.285 |
| Standard deviation | 0.008 | 0.008 | 0.004 |
| Phase B, Experiment 3—1000 mcg. Thiamine Daily | | | |
| 18 | 0.242 | 0.275 | 0.266 |
| 19 | 0.258 | 0.276 | 0.263 |
| Mean | 0.250 | 0.276 | 0.265 |
| Standard deviation | 0.008 | 0.001 | 0.002 |
| Statistical Data | | | |
| t (control period vs. Phase A) | 2.02 | 1.07 | 1.69 |
| Significance level | 10% | 40% | 20% |
| t (control period vs. Phase B) | 2.21 | 2.16 | 0.73 |
| Significance level | 10% | 10% | 50% |

## DISCUSSION

In an experiment of this nature the number of subjects involved is, of necessity, limited. However, there are some tendencies that are so consistent that they deserve some discussion. In the data it is shown that, as a rule, when the thiamine content of the diet was sufficiently reduced, the reaction time became longer. In this investigation all subjects eating not more than 140 mcg. thiamine per day experienced an increase in reaction time, which was significant at the 10 per cent level or above, but when the thiamine intake was increased to 200 mcg. per day, only one-half the subjects showed an increase in reaction time, significant at the 1 per cent level.

The variability of the subject's reaction time to a given level of thiamine suggests that there is a considerable individual difference in tolerance to low-thiamine diets. By referring to Table 3, it is seen that while the reaction time of Subjects *7* and *9* became significantly longer, Subject *8* was unaffected, and Subject *11* improved. There is also evidence of differences in individual tolerance to a low-thiamine diet in Table 2. Although all subjects

TABLE 6

*Summary of data presented in Tables 3, 4, and 5 for Experiment 3. A plus sign denotes that the subject was slower in her reaction time, and a minus sign that the subject was faster, the difference being significant at the level of significance indicated.*

| SUBJECT | CHANGE IN REACTION TIME | |
|---|---|---|
| | Phase A | Phase B |
| Thiamine Intake of Not More Than 200 mcg. Daily | | |
| | % | % |
| 7 | +1 | +1 |
| 8 | 0 | −40 |
| 9 | +10 | +1 |
| 11 | −5 | −2 |
| Thiamine Intake of Not More Than 625 mcg. Daily | | |
| 5 | −20 | +60 |
| 6 | +90 | −90 |
| 12 | +90 | +50 |
| Thiamine Intake of Not More Than 1000 mcg. Daily | | |
| 1 | +10 | −10 |
| 2 | +40 | +10 |
| 3 | +20 | −50 |

showed an increase in reaction time, the extent of the effect was variable, some of them being significant at the 1 per cent, some at the 5 per cent, and some at the 10 per cent level.

There is also evidence which suggests that over a long period, individuals adjust somewhat to low-thiamine diets. For example, in Table 3 it is shown that the reaction time for Subjects *7*, *8*, and *9* tended to become less during the eighteenth and nineteenth weeks than during the fifth and sixth weeks. Subject *11* continued to improve in reaction time throughout the experiment even though she was on a diet low in thiamine as attested by the low level of thiamine output in the urine (5).

One subject in the group deserves special comment. During Experiment 2, Subject *9*—a control subject—showed a consistent and progressive increase in reaction time even though she was receiving 1340 mcg. thiamine per day (Table 1). During Experiment 3 this same subject while receiving only 200 mcg. thiamine per day (Table 3) developed clinical symptoms of thiamine deficiency during the seventeenth week and was removed from the low-thiamine diet. These symptoms developed in spite of the fact that her thiamine output was not as small as in other cases. Also, she reacted violently to the large dose of supplement, but subsequently the symptoms of thiamine deficiency disappeared in the course of two weeks. It is believed that this subject not only reacted to dietary regimes but also required more thiamine than the average individual.

It is doubtful if it is possible to set a minimum thiamine requirement for the population at large. As seen in the data relative to reaction time, 200 mcg. thiamine per day for subjects eating 2500 calories was not adequate for all of them. However, as far as the data presented here are concerned, 625 mcg. thiamine per day were apparently adequate to maintain normal reaction time status for subjects eating 2500 calories. This figure, 250 mcg. per 1000 calories, is considerably lower than most of the minimal thiamine requirements tabulated by Melnick (6) in a summary of studies dealing with the requirement of man.

## SUMMARY AND CONCLUSIONS

The data relative to reaction time presented in this paper involve a two-year period of experimentation. The first year was devoted to the construction and management of low-thiamine diets and the development and standardization of techniques for measuring reaction time. During the second year, the effect of five different levels of thiamine intake on reaction time was investigated. On the basis of the data collected, the following conclusions seem justified:

(a) Subjects receiving 2500 calories per day were found without exception to suffer an increase in reaction time within forty-five days when the thiamine intake was 140 mcg. or less. Also the reaction times were more erratic at this level of intake.

(b) The reaction time of subjects on daily thiamine intakes of 200 mcg. showed a tendency to be *less increased* after eighteen or nineteen weeks than after five or six weeks, while the average daily urinary excretions of thiamine in these same subjects decreased progressively over a nineteen-week period.

(c) There was evidence of considerable individual variation in increased reaction time induced in young adults by a low-thiamine intake.

(d) All subjects on daily thiamine intakes of 625 mcg. or 1000 mcg. respectively showed either no appreciable change in reaction time or a tendency toward a decrease in reaction time.

(e) It is suggested that considerable time is required for complete recovery from a deficiency resulting from a low-thiamine diet.

(f) It is doubtful if a minimum thiamine requirement for the population at large can be established, since there was a rather wide individual variation in tolerance to low-thiamine diets. However, it was found that subjects whose food requirement was approximately 2500 calories per day maintained their normal reaction time when the diet contained 625 mcg. thiamine.

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### *Virus Cause of Infectious Hepatitis Found*

Two viruses that cause liver inflammation when injected have been discovered by Dr. John R. Neefee, University of Pennsylvania. Only one, however, called "IH," causes infectious hepatitis; the other, named "SH," causes homologous serum hepatitis. Both could be spread by insects.—*New York Times, May 16, 1948.*

# The Composition of Chinese Foods[1]

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DURING the recent war it seemed likely that large numbers of United States' troops would be billeted in China and that they would require large quantities of foods grown on Chinese soil. To plan the rations of the American troops and the Chinese civilians, it was necessary to know the composition of these oriental foods.

A study of the available data on Chinese foods (1) and of the table on far eastern foods prepared in 1944 by the Committee on International Food Value Problems of the National Research Council [Wu (2)] indicated that few of the foods of China had been analyzed for vitamin content. There was no well equipped food laboratory with trained personnel in areas not occupied by the Japanese, and it was not feasible to send the equipment and personnel into China by air so that these basic data might be obtained. As consultant to the United States Foreign Economic Administration one of us[3] organized a project, in collaboration with the Army Air Forces and the Chinese government, in which samples of food were collected by the staff of the Chinese Institute of Nutrition, flown to the United States by the Army Transport Command, and analyzed at the laboratories of the Massachusetts Institute of Technology. Four fellowships were provided to Chinese students so that they might be trained in the newest methods of food analysis, assist in the analysis of these foods, and later return to China to continue this research as members of the staff of the Chinese Institute of Nutrition.

Hostilities with Japan ended shortly after this program had started, and the results were no longer of military importance. Nevertheless, the research was continued through June, 1946, because data on the composition of Chinese foods were still of basic importance in planning for the relief and recovery of China during the postwar period. The United States State Department replaced the Foreign Economic Administration in this program when the latter agency was dissolved in September, 1945, and some food samples were shipped by boat after the Army Transport Command suspended operations across the Pacific.

Fewer samples were analyzed during the year of this project than were anticipated because several shipments failed to reach their destination. The results of the analysis of fifty-six food samples are reported here. It is expected that these results will be supplemented by data to be published from the laboratories of the Chinese Institute of Nutrition. Laboratories are being established in Peiping and experienced chemists are returning to work there.

## EXPERIMENTAL PROCEDURE

### *Method of Sampling*

Samples were collected by representatives of the Chinese Institute of Nutrition under the supervision of Dr. M. N. Walker, an agronomist of the United States Foreign Economic Administration.

All samples of fresh vegetables were taken directly from the field, and many of the staple foods and prepared foods were purchased in shops. All samples represented foods grown in Koloshan and other villages near Chungking, for collections could not be made in areas under Japanese control. A record was made of the farm or shop where each sample was taken, the habitat, treatment with fertilizer, rainfall, color, size, stage of maturity, gross weight, and weight of the edible portion. Only the edible portion was shipped, and analytical results are expressed in terms of the edible portion as purchased.

In each case only one strain of a plant was col-

[1] Received for publication August 13, 1948.

[2] The authors wish to acknowledge assistance from Drs. P. Z. King, J. Heng Liu, Hsien Wu, and C. Y. Chou of the National Institute of Health of China; from Drs. George Reynolds and M. N. Walker of the United States Foreign Economic Administration; from Dr. H. S. Frank of the Division of Cultural Cooperation, United States Department of State; from the Army Air Forces Command; and from the W. K. Kellogg Foundation which provided funds for fellowships.

[3] R.S.H.

lected. In collecting seeds and other moderately small particles, 200 gm. were taken from a large sample that had been thoroughly mixed. Whenever the unit size of a vegetable or fruit was large, representative portions from each of fifteen or more plants were combined into one sample.

Samples of dry, staple foods were placed in amber bottles and shipped without further treatment. Samples of perishable foods were subdivided into two sub-samples. One sub-sample was slurried with sulphuric acid (50 cc. 0.1 N $H_2SO_4$ to each 200-gm. sample), and the other was slurried with 25 cc. of alcoholic potassium hydroxide (95% $C_2H_5OH$ containing 1% KOH to each 100 gm. of sample). Five cc. of chloroform were added to each sample before the jar was sealed. Preliminary studies on a few typical fruits and vegetables had indicated that samples preserved thus would show no significant loss in nutritive content (except possibly ascorbic acid) during several months' storage at room temperature.[4]

Food collections were made from August through November, 1945. Samples arrived in Cambridge, Massachusetts, within two weeks. Soon after arrival, the acid-treated sub-samples were analyzed for thiamine, riboflavin, niacin, and nitrogen content, while those treated with alcoholic potassium hydroxide were analyzed for carotene, iron, calcium, phosphorus, ash, and moisture content. The values obtained for these sub-samples were then used to calculate the nutritive content of the original sample of fresh food.

### *Methods of Analysis*

In the laboratory the wet samples were mixed thoroughly by reslurrying before portions were taken for analysis. The dry samples were ground in an electric coffee mill until fine enough to pass through a #20 mesh sieve.

Moisture, ash, nitrogen, and calcium content were measured according to the methods established by the Association of Official Agricultural Chemists (4); phosphorus according to the method of Fiske and Subbarow (5), and iron by the procedure of Koenig and Johnson (6). Carotene was determined by using the saponification and extraction method of Kemmerer and Fraps (7) and the adsorption and elution method of Moore (8).

Niacin was estimated by the microbiologic method of the United States Pharmacopeia (9); thiamine according to the method of Moyer and Tressler (10); and riboflavin by the method of Andrews (11).

In reporting the results of these analyses, the foods have been arranged alphabetically according to their English names. All data have been calculated to the "wet basis"; that is, in terms of the foods when the samples were taken at the farm or in the shop.

[4] This conclusion has been confirmed by later research by Goldblith and Harris (3).

### DESCRIPTION OF SAMPLES

The samples analyzed under this program are listed below. In each case the English, Chinese, and botanical names are presented. A brief description is given of the soil conditions under which the sample was grown. Only "night soil" was used as fertilizer, and neither irrigation nor fertilizer were employed in cultivation unless specifically mentioned. The comments on some of the culinary methods used in preparing these foods are admittedly fragmentary, but they indicate how these foods are used in the Orient. Data on the effects of Chinese cooking methods upon the vitamin content of foods will soon be presented.

Two terms are used below which require definition. In *stir-frying*, the ingredients are cut into slices, cubes, or shreds. These ingredients are then added one by one to a pan containing a little hot fat and in reverse order to the time required to cook them. The additions are timed so that the cooking of all ingredients is completed at the same time. These foods are sliced so thinly that all components are cooked within 3 min. *Red cooking* is a method of stewing beef, lamb, mutton, chicken, duck, or carp with soy sauce. The cooking time varies between 2 to 6 hr.

**Apricot kernel (sweet),** *Hsing jen* (*Tian*), Prunus armenaica L. Taken from Pei P'ei, Szechuan. One-half kg. of shelled kernel was purchased in a shop. This food is customarily eaten as nuts, but often ground into powder and stirred into boiling water or used in almond cakes or biscuits. It is relatively expensive.

**Bamboo, water,** *Chiao pai*, Zizania aquatica L. Ripe shoots 9 to 21 cm. long were taken from an irrigated farm in Lung Fung Hsiang. During a short season water bamboo is cheap and abundant in areas where it grows. It is usually stir-fried, either alone or with meat.

**Bean, flat (fresh),** *Pien tou* (*Hsien*), Dolichos Lablab L. Fresh green pods 7 to 9 cm. long, 2 to 4 cm. broad, were taken from clay soil in Lung Fung Hsiang. This bean is similar to string beans and is usually eaten fresh, stir-fried alone or with meat. It is abundant and cheap in summer.

**Bean, kidney,** *Ts'ai tou*, Phaseolus vulgaris L. Dried beans, 15.5 gm. per 100 seeds, were bought in a Chungking market. Kidney beans are usually stir-fried alone or with meat. They are relatively abundant in summer season.

**Cabbage, swamp,** *Kung hsin ts'ai* (*Wung ts'ai*), Ipomaea Reptans Poir. Taken from a farm in Koloshan. Kankong grows in fresh water ponds and swamps throughout the Far East. It resembles the sweet potato vine. The tender stems and young leaves are a favorite green in this area and are frequently gathered and sold in native markets.

**Cabbage, white mustard,** *Hsiao pai ts'ai*, Brassica chinensis L. Taken from fertilized clay loam soil

on a farm in Koloshan. This is a 13- to 18-cm. long green vegetable. The sample had been planted only thirty days before and was thus rather young. This food is inexpensive and widely used in the summer, either fried alone or with shrimp and meat.

**Carrot tops (wild),** *Lofu ts'ai*, Daucus Carota L. Taken in Koloshan thirty days after planting in hilly fertilized clay soil. Leaves are about 11 cm., and weight of each plant 1 to 4 gm. It is customary to preserve the tops for several days in salt, then stir-fry with or without meat. The fresh tops are often used in soups. It is cheap and frequently eaten.

**Chestnut,** *Li tzu*, Castanea mollissima Blume. Bought in a market in Koloshan. The average weight of a nut was 3.4 gm. This is one of the most popular nuts in China, and is eaten fresh, roasted in hot sand, or cooked with meat or chicken. It is widely used but its high price limits its consumption.

**Corn,** *Yü mi*, Zea mays L. Taken from a farm in Ta Tian Chih, where it was grown on loamy, fertilized soil. In certain areas, corn is a major food among farmers with low incomes, who commonly alternate it with rice and wheat. It is seldom eaten by middle and upper classes, and then only between meals. Fresh corn is steamed while dried corn is popped or ground into flour. In Manchuria, corn is a major foodstuff.

**Cowpea with pods,** *Chiang tou chia*, Vigna unguiculata (L.) Walp. Taken from loamy hill soil on a farm in Koloshan. The pods were 25 to 42 cm. long. This is an inexpensive food which is widely used during summer, usually stir-fried alone or in combination with shrimp and meat.

**Cowpea, red,** *Hung ch'iang tou*, Vigna unguiculata (L.) Walp. Purchased as dry beans in a shop in Koloshan. Red cowpeas are customarily used to make purée of congee with rice. They are rather cheap but used less extensively than soybeans.

**Eggplant,** *Ch'ieh tze*, Solanum Melongena var. Esculenta Dunal Nees. Taken from fertilized hilly, clay soil in Koloshan. This food is violet, pear-shaped, 9.5 to 19.5 cm. long, 5 cm. in diameter, and averages 120 gm. in weight. This inexpensive food is used abundantly in summer, and it is popular when deep fat fried, stir-fried, boiled, or steamed. It is often eaten sliced, stuffed with meat, dipped in starch and egg paste and stir-fried. In Hunan it is customary to parboil halved sections in boiling water, dry in the sun for 12 hr., and preserve in salt, hot pepper, spice, and water in a clay jar. Sometimes it is steamed with pork or ham or eaten directly from the jar.

**Eggs, duck, limed,** *Pitan* (*Sung-hua*). Purchased in a shop in Koloshan. Eggs are now limed by dipping into 3 per cent sodium hydroxide solution for one month or longer. The traditional method is to store the eggs wrapped with a lime and clay mixture. Often spruce twigs are burned and their ashes are mixed with lime. Limed eggs are eaten with or without soy sauce, vinegar, and a little sliced ginger. These eggs are expensive and strongly flavored.

**Gourd, bitter,** *K'u kua*, Momordica Charantia L. Taken from loamy, fertilized soil. Gourds were yellow white with knobs on surface, 12 to 20 cm. long, 2 to 4 cm. in diameter, 25 to 57 gm. in weight. This inexpensive food is stir-fried with meat or cooked in soups. Bitterness is reduced by rubbing on salt before cooking. The Cantonese cook gourds with chicken, frogs' legs, or stuffed with meat.

**Gourd, white,** *Tung kua*, Benincasa cerifera Savi. Taken from fertilized clay soil eighty days after planting in Koloshan. Gourds were blue-green, 34 to 51 cm. long, 12 to 14 cm. in diameter, and weighed 2600 to 7000 gm. This is a common food in the summer and fall. It has a mild delicate flavor and is often prescribed for the sick. White gourd soup, with ham, is a favorite dish in China. Sometimes seeds are removed, and the gourd is stuffed with meat, chicken, mushrooms, and bamboo shoots and then steamed. Gourds are also used in candy.

**Horse bean, dried,** *Ts'an tou* (*kan*), Vicia Faba L. Grown on fertilized clay land. This is a common and inexpensive legume in China. When eaten in the fresh form, the pods are removed and the beans stir-fried alone or with meat. Immature pods are puréed and eaten as a delicacy. Beans are also ground to a paste and fermented. Mature beans are generally fried in deep fat until crisp, then salted and eaten between meals or at breakfast with rice congee.

**Jew's ear,** *Mu-erh*, Auricularia auriculae-judae (Schroet). Purchased in a shop in Min Kuo Road, Chungking. This fungus is a favorite food throughout China but is produced mainly in the provinces of Yunan, Keichow, and Szechwan. One variety which grows on wooden logs is called pai-mu-erh (white wooden ear) while that growing on stones is known as shih-erh (stone ear). Pai-mu-erh is considered to be the more nutritious and is used as a medicine but seldom as a food. Mu-erh is a brown fungus which grows like mushrooms in clusters on logs in damp and shady places. The dry form is sold in markets and is brittle and black. When soaked for 15 min. in water, it rehydrates, expands to its original dimensions, and becomes soft and pliant like a mushroom. It has little taste and is usually stir-fried with chin chen hua (yellow day lily blossoms) and thinly sliced meats. It is said to be a delicious dish.

**Job's tears,** *I mi*, Coix lacryma Jobi L. Purchased in a Chungking market. White, .06 gm. per grain. This is a cereal used in congee, sometimes with meat, but it is more expensive than rice or wheat. Sugar, dates, lotus seeds, fruits, and meat are used to flavor the congee.

**Lettuce,** *Wo chü chi'ng*, Lactuca sativa L. Taken mature from fertilized loam soil in Lung Fung Hsiang. Lettuce, when eaten as a cold dish, is usually first dipped for several minutes in boiling water

then cut into strips and mixed with sesame oil, salt, vinegar, and condiments. It can be stir-fried with meat. Occasionally lettuce is pickled.

**Lily blossom, yellow day,** *Chin chen hua*, Hemerocallis flava L. Purchased in a Chungking shop. This is a favorite sweet-tasting food. The flowers are picked before fully opened, then air dried. Before use in cooking, it is rehydrated in water, then stir-fried with meat or mu-erh or both, or used in soups. It is rather inexpensive.

**Lily bulb, dried,** *Pai-ho (kan)*, Lilium tigrinum Ker-Gawl. Purchased in a shop in Chungking. This is a delicacy said to possess a "cooling" effect. It is eaten in summer, especially at tea-time. After peeling, the bulb is boiled in water. It becomes glutinous and has a bitter taste that can be masked by sugar.

**Maltose, crude,** *Mei ya tang*. Purchased as an amorphous cake in a shop in Ta Tien Chih. It is manufactured from wheat by the action of malt, and is cheap; used in candies and in diets for the sick.

**Mung bean starch, jelly strip,** *Fen tiao*, Phaseolus Mungo L. Purchased as a dry product in the market at Koloshan. This product is made from mung bean flour dough which is pressed through circular orifices directly into boiling water. After cooking, the circular strings are dried. This mung bean product has little flavor and is used in soups with Chinese cabbage, meat, and eggs, or is stir-fried with meat. It is widely used throughout China and is relatively inexpensive.

**Mung bean sprouts,** *Lü tou ya*, Phaseolus Mungo L. A 200-gm. batch of mung beans was gathered from a farm in Koloshan. It was washed with distilled water, spread in a thin layer between moist cloths in shallow porcelain pans, and covered. Distilled water was sprinkled over the beans eight times daily to keep them moist without immersion. Germination was continued at 24°C. for 70 hr., at which time the sprouts were 2 to 4 cm. long. Mung bean sprouts are used in soup, in stir-fried vegetables, and meat dishes. They are a popular food.

**Muskmelon,** *Tsai kua*, Cucumis melo var. conomon makino. Taken eighty days after planting in fertilized clay soil in Koloshan. The melon is deep green with white lines on surface, 10 to 14 cm. long, 6 to 8 cm. in diameter, and 131 to 134.7 gm. in weight. It is a summer vegetable which is eaten raw as a salad or pickled with vinegar and sugar.

**Mustard root, pickled,** *Cha ts'ai*, Brassica juncea (L.) Coss. Purchased in a shop in Lee Tze-Pa, Chungking. Each root (approximately 75 gm.) is cut in two to three pieces and preserved with salt and hot pepper powder rubbed on the surface. After three months, the pickled root is ready for eating. Usually this food is consumed uncooked or after stir-frying. Though it is a great favorite among the Chinese people, the root is produced mainly in the southwestern provinces (such as Szechuan and Yunan), and only those living in these areas can eat it regularly. Transportation costs make it so expensive in other areas that consumption is limited to the upper-middle classes.

**Onion, fragrant,** *Chiu ts'ai*, Allium odorum L. Taken from fertilized, loamy soil in Koloshan. The leaves were green and the stems were white, 22 to 35 cm. long, weighing 2 to 3 gm. per plant. The leaves and stems of these plants are eaten like scallions. They are usually stir-fried with shredded pork, pork liver, or vegetables (especially bean sprouts), and also used as condiment. It is a popular, cheap food.

**Onion, Welsh,** *Tsung*, Allium fistulosum L. Taken from clay soil, ninety days after planting in Sien Wei Shan. The leaves are green, the stem white, from 28 to 43 cm. long, and 0.5 to 1.0 cm. in diameter. Its chief use is as a seasoning in nearly all cooked dishes, whether stir-fried, boiled, or red-cooked. In North China, large quantities are eaten raw. It is an inexpensive food available in all seasons.

**Orange, sweet,** *Kuang kan*, Citrus sinensis (L.) Osbeck. Taken from fertilized land on a farm in Lung Fung Hsiang. It is a yellow fruit weighing 94 to 178 gm. It is a product of Szechuah province—abundant and cheap in southwestern provinces, expensive in the North because of high shipping costs. The peel is dried and used in medicine.

**Orange, tangerine,** *Chu tzu*, Citrus nobilis var. deliciosa (Ten.) Swingle. Taken from an orchard in Lung Fung Hsiang from trees growing on fertilized, loamy soil. The average weight of the fruit is 80 gm. It grows abundantly in South China, especially in Fukien and Szechwan provinces. It is eaten as fruit, or the juice is made into a sweet soup. The peel and fibre are used in medicine.

**Pea,** *Wan tou*, Pisum sativum L. Dry peas were purchased in the market in Koloshan. This is a legume common in China, where the young, tender peas are cooked in the pods with meat. Fresh peas are cooked with all types of meat, poultry, and fish, and with shrimp. Dry peas are boiled in dishes, made into cakes and puddings, or puréed in pea cakes. It is popular and moderately inexpensive.

**Pea starch jelly,** *Wan tou liang fen*. Purchased in a Koloshan market. This product is made from peas by soaking in water for 24 hr. and passing the paste through cheesecloth. The purée is boiled on a slow fire for 2 to 3 hr., cooled, calcium carbonate is added, and the coagulant is dried. It has a mild flavor and is eaten with soy sauce, vinegar, ginger, sesame oil, cucumber slices, and condiment. It is a cheap and popular food.

**Peanut,** *Hua sheng jen*, Arachis hypogaea L. Purchased in the market in Chungking. The average weight per kernel is 0.7 gm. Peanuts are popular especially at breakfast and when boiled with salt. Where abundant (Honan province), they are cooked with meat or used as a regular dish each

day. In other areas roasted peanuts are eaten between meals with watermelon seed at tea.

**Persimmon,** *Shih tau*, Diospyros kaki L. Purchased in the market in Koloshan. This is an orange fruit, 5 to 5.5 cm. long, 6.5 to 7 cm. in diameter, and 132 to 166 gm. in weight. The persimmon is produced in many parts of China, is available fresh in autumn, but the dried or preserved fruit is available in all seasons. The dried persimmon tastes like dried figs and is consumed between meals.

**Potherb mustard,** *Hsueh li hung*, Brassica juncea var. crispifolia (Bailey). Taken from fertilized loam in Lung Fung Hsiang. This green vegetable (42 to 61 cm. long) is common in China, is usually salted before eating with meat, bean sprouts, or horse beans, and is often used as a separate dish.

**Pummels,** *Yu tzu*, Citrus maxima (Burm.) Merrill. Taken from an orchard in Lung Fung Hsiang. Pummels are a green-yellow fruit weighing 520 to 760 gm. and resemble grapefruit. They are cheap and abundant in South China, expensive in the North.

**Pumpkin,** *Wo kua* (*Nan kua*), Cucurbita moschata Duchesne. Taken eighty days after planting in fertilized loam on a farm in Koloshan. The Chinese pumpkin is green with white surface spots, 12 to 17.5 cm. long, 19 to 25 cm. in diameter, and 1.9 to 3.6 kg. in weight. Abundant in the summer and fall, pumpkins are stir-fried, boiled, or baked. The poor use it as a rice substitute. It stores well unrefrigerated.

**Rice, glutinous,** *No mi*, Oryza glutinosa Lour. Purchased in the Koloshan market. This rice is common in China, but it is not used in the daily diet. Instead, it is consumed on feast days, such as the New Year, the Moon Festival, and the Fifth of May. The "eight precious puddings," made from steamed glutinous rice, preserved fruits, nuts, and bean purée, are wrapped in bamboo leaves and steamed. This rice if used in "eight jewel meal" as stuffing, is ground into flour, and made into cakes or balls.

**Rice, fermented,** *Chiu niang* (*Lao tsao*). Purchased in a Koloshan store. Glutinous rice was soaked in water for 8 hr., steamed for ½ hr., and washed in cold water. Two "ferment balls," each weighing 1.5 gm. (obtainable from any grocery), were ground to powder, suspended in water, and poured over the steamed rice. After mixing, it was placed in covered porcelain container and allowed to stand at 25° to 30°C. for 36 hr. Customarily, fermented rice is eaten without cooking as a separate dish or is boiled with water, sugar, and eggs. Though inexpensive, it is not a popular food.

**Rice, third grade,** *San hao pai mi*, Oryza sativa L. Purchased in the market in Koloshan. Rice is the staple food of South China. It is graded according to degree of polishing with the whitest and most highly polished the most expensive. Third grade rice is consumed by the masses in China.

**Soybean cheese,** *Ch'ou tou fu lu*. Purchased in a shop in Sha Ping Pa. This curd is made by putrefying soybean curd, then sealing it in a preserve jar with wine and spices. After one month it can be eaten with sesame seed oil without cooking. The curd has a very strong odor and flavor and is used as an appetizer by the wealthy and as a main dish by the poor in many provinces.

**Soybean curd,** *Tou fu*. Purchased in a Koloshan shop. The curd is made by soaking soybeans overnight in water, grinding, adding water, and straining through cheesecloth. The liquid is simmered over a low flame for 2 hr., cooled, and treated with lime. The coagulant is separated and pressed to a curd cake. The curd is used in numerous ways, especially in soups, stir-fried with meat, vegetables, mushrooms, or used alone. It is salted and smoked and eaten in the dry form, is served in salads without treatment, and is fermented to make cheese.

**Soybean curd, fermented,** *Tou fu lu*. Purchased in a shop in Lee Tze-Pa, Chungking. This curd is made like soybean cheese (*ch'ou tou fu lu*) except that the putrefaction is not as advanced and the flavor is milder.

**Soybean curd sheet,** *Ts'ian chang tou fu*. Purchased in the market in Koloshan. This product is made by compressing soybean curds between layers of cheesecloth in very thin sheets, hence the common name "thousand sheet bean curd." It is seldom cooked alone, but usually red-cooked with meat on a low fire or it is cooked with other soy products, "oil skin," smoked bean curd, mu-erh, and yellow day lily blossom all in one dish. This is a specialty among vegetarians.

**Soybean curd, smoked,** *Tou fu kan*. Purchased in the market in Koloshan. This product is made like soybean curd except that it is smoked and it contains less moisture. It is eaten without further treatment, is stir-fried with meat with additions of onions, hot peppers, and spices. It is very popular.

**Soybean, fermented,** *Tou chi*. Purchased in a shop in Lee Tze-Pa, Chungking. Fermented soybean is made by boiling or steaming whole beans, then allowing them to ferment, after which they are salted. Hot peppers and spices are then added, and the mixture is sealed in a jar. In southwestern provinces this is a main dish. In other regions, fermented soybeans are used to flavor other dishes.

**Soybean, milk clot (oil skin),** *Yu pi*. Five sheets (360 gm. total) of "oil skin" were purchased in the market in Koloshan. This had been prepared by cooking soybean flour in water, evaporating much of the water, and removing the tough skin that formed on the surface on cooling. This product is used in soups, is cooked with red meat, or is used in meat stuffings. It is seldom cooked alone and is a moderately expensive, manufactured product.

**Soybean sprouts,** *Huang tou ya*. Sprouts were made from beans purchased in a shop in Koloshan.

After washing they were placed in a porcelain pot with an opening at the bottom. Four times daily they were sprinkled with water. After six days the sprouts were 6 to 7 cm. long.

**Soybean, yellow,** *Mao tou* (fresh) and *Ta tou* (dried), Glycine Max. Merr. Purchased in a Koloshan market. This strain is found throughout China, especially in Manchuria which produces 90 per cent of the soybeans grown in China. Soya is a major food but is seldom eaten fresh except the very immature tender beans. It is made into over twenty types of products, notably soybean curd, fermented soybean, soybean sauce, and soybean oil. It is cheap and nutritious and furnishes much protein.

**Vegetable sponge,** *Sze kua*, Luffa cylindrica Roem. The sample was taken three months after planting in fertilized clay soil in Koloshan. This melon is highly seasoned and is common in South China in the summer. It is eaten after stir-frying or boiling in meat soups, or eaten as a separate cooked dish.

**Vermicelli, wheat flour,** *Kua mian*. Our sample, 750 gm., was purchased in shop in Pei P'ei, Szechuan.

**Wheat—strain: N.A.R.B. No. 28,** *Chung-nun hsiao mai 28*, Triticum vulgare Vill. Taken from loamy soil in Tian Sheng Ch'iao. Wheat is a staple food in North China and is used only occasionally in South China. Bread, noodles, cakes, and wine are made from it.

**Wheat flour,** *Mian fen*. First grade flour taken from a quantity in a shop in Chungking.

**Yam,** *Chiao p'an shao*, Dioscorea Batatas Deone. Grown on fertilized, loamy soil on a farm in Lung Fung Hsiang. A yam is a root vegetable 11 to 22 cm. long, 4 to 15 cm. wide, and weighing 59 to 703 gm. It is a common food in China but not as common as sweet potatoes. Generally, it is stewed, baked, boiled, or red-cooked with meat.

## RESULTS AND DISCUSSION

Few of the foods listed in Table 1 have been completely analyzed before, and many had not been even partially analyzed.

The few food samples analyzed under this program include the most important vegetables, cereals, legumes, and food products consumed in China during the summer months. Many other foods still remain to be analyzed. Additional samples of each food, grown under a variety of soil and climate conditions, must be studied before China can have an accurate estimate of the quality of her food resources. Furthermore, the menus of the people must be surveyed and analyzed for each important nutrient before the quality of the dietaries of the Chinese people can be accurately assessed. Thus, this report of the composition of a few Chinese foods is but a preliminary step in an extensive program to be undertaken by the Chinese Institute of Nutrition.

### *Protein*

The nitrogen content of the food samples is reported in Table 1. The protein equivalents have not been calculated because the correct conversion factor for most of these foods is not known. The foods richest in nitrogen content (expressed in grams per 100-gm. sample) were: peas, 6.9; sweet apricot kernels, 6.9; soybean milk clot (oil skin), 6.8; dried yellow soybeans, 5.7; soybean curd sheet, 5.2; fresh yellow soybeans, 4.1; horse beans, 4.1; peanuts, 4.0; kidney beans, 3.7; red cowpeas, 3.6; smoked soybean curd, 3.2; glutinous rice, 3.2; and vermicelli, 3.1. It is interesting to note that soybeans and soybean products, which are widely used in China, are rich in nitrogen content.

### *Calcium*

A number of the foods were rich in calcium content. The most important (expressed in milligrams per 100-gm. sample) were: smoked soybean curd, 571; yellow day lily blossoms, 463; Jew's ears, 357; dried yellow soybeans, 333; soybean milk clot (oil skin), 319; soybean cheese, 303; soybean curd sheet, 284; kidney beans, 225; white mustard cabbage, 224; fermented soybean curd, 214; bitter gourds, 173; pickled mustard root, 163; carrot tops, 143; sweet apricot kernels, 141; fermented soybeans, 130; and soybean sprouts, 126. The soybean and its products are notable sources of calcium. The yellow day lily blossom and Jew's ear are also important because these two are widely used in China and 100 gm. can easily be consumed in a meal.

### *Phosphorus*

The foods richest in phosphorus content (expressed in milligrams per 100-gm. sample) were: kidney beans, 561; dried yellow soybeans, 466; peanuts, 309; horse beans, 307; red cowpeas, 304; wheat, 295; soybean sheet, 291; peas, 225; corn, 251; egg yolks, 251; fresh yellow soybeans, 223; fermented soybean cheese, 222; pea starch jelly strip, 214; sweet apricot kernels, 202; and Jew's ears, 201.

### *Calcium: Phosphorus Ratio*

It is generally agreed that a calcium: phosphorus ratio of approximately 1:1 is best in the human dietary. Among the foods which were rich in both these minerals, the ratio was as follows: smoked soybean curd, 3:1; yellow day lily blossom, 2.7:1; Jew's ear, 1.8:1; soybean milk clot (oil skin), 1.8:1; soybean cheese, 1.4:1; fermented soybean curd, 1.2:1; soybean sprouts, 1.2:1; soybean curd sheet, 1:1; and dried yellow soybean, 0.7:1. All but the last may be useful sources of these two minerals.

### *Iron*

Among the foods analyzed, Jew's ear was richest in iron having 185 mg. per 100 gm. of sample. The

TABLE 1

*Composition of Chinese food*

| AMERICAN NAME | CHINESE NAME | BOTANICAL NAME | WATER | ASH | NITROGEN | CALCIUM | PHOSPHORUS | IRON | CAROTENE | THIAMINE | RIBOFLAVIN | NIACIN |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | *gm./100 gm.* | *gm./100 gm.* | *gm./100 gm.* | *mg./100 gm.* | *mg./100 gm.* | *mg./100 gm.* | *mg./100 gm.* | *mg./100 gm.* | *mg./100 gm.* | *mg./100 gm.* |
| Apricot kernel (sweet) | Hsing jen (Tian) | Prunus armenaica L. | 9.5 | 2.6 | 6.9 | 141 | 202 | 3.9 | 0.00 | 0.14 | 0.49 | 1.6 |
| Bamboo, water | Chiao pai | Zizania aquatica L. | 60.0 | 1.5 | 1.2 | 8 | 43 | 3.4 | 0.00 | 0.09 | 0.04 | 0.2 |
| Bean, flat (fresh) | Pien tou (Hsien) | Dolichos Lablab L. | 62.1 | 1.3 | 1.3 | 34 | 38 | 1.4 | 0.00 | 0.08 | 0.07 | 0.7 |
| Bean, kidney | Ts'ai tou | Phaseolus vulgaris L. | 32.9 | 4.1 | 3.7 | 225 | 561 | 1.4 | 0.05 | 0.44 | 0.17 | 1.3 |
| Cabbage, swamp | Kung hsin ts'ai (Wung ts'ai) | Ipomaea Reptans Poir | 92.4 | 1.1 | 0.3 | 42 | 35 | 3.0 | 0.00 | 0.06 | 0.12 | 0.8 |
| Cabbage, white mustard | Hsiao pai ts'ai | Brassica chinensis L. | 59.9 | 2.0 | 0.4 | 224 | 47 | 3.8 | 0.12 | 0.06 | 0.17 | 0.9 |
| Carrot tops, (wild) | Lofu ts'ai | Daucus Carota L. | 60.5 | 1.6 | 0.3 | 143 | 64 | 3.2 | 0.02 | 0.07 | 0.08 | 0.4 |
| Chestnut | Li tzu | Castanea mollissima Blume | 42.1 | 1.3 | 1.7 | 26 | 95 | 2.5 | 0.00 | 0.12 | 0.22 | 0.5 |
| Corn | Yü mi | Zea mays L. | 18.3 | 1.4 | 1.6 | 16 | 251 | 0.5 | 0.00 | 0.28 | 0.12 | 2.6 |
| Cowpea with pods | Chiang tou chia | Vigna unguiculata (L.) Walp. | 86.5 | 1.4 | 0.5 | 42 | 58 | 2.0 | 0.00 | 0.13 | 0.10 | 1.0 |
| Cowpea, red | Hung ch'iang tou | Vigna unguiculata (L.) Walp. | 12.5 | 2.5 | 3.6 | 92 | 304 | 3.5 | 0.03 | 1.09 | 0.02 | 2.1 |
| Eggplant | Ch'ieh tze | Solanum Melongena var. Esculenta Dunal Nees | 94.0 | 0.9 | 0.2 | 31 | 23 | 1.3 | 0.01 | 0.03 | 0.05 | 0.4 |
| Eggs, duck, limed | Pitan (Sung-hua) | | | | | | | | | | | |
| whites | | | 48.5 | 2.6 | 2.5 | 21 | 72 | 2.3 | 0.00 | 0.01 | 0.03 | 0.8 |
| yolks | | | 45.7 | 3.5 | 1.9 | 106 | 251 | 7.4 | 0.73 | 0.00 | 0.02 | 0.1 |
| Gourd, bitter | K'u kua | Momordica Charantia L. | 77.7 | 1.0 | 0.1 | 173 | 33 | 1.2 | 0.00 | 0.04 | 0.03 | 0.3 |
| Gourd, white | Tung kua | Benincasa cerifera Savi | 79.6 | 0.6 | 0.1 | 38 | 46 | 1.0 | 0.00 | 0.04 | 0.11 | 0.3 |
| Horse bean, dried | Ts'an tou (kan) | Vicia Faba L. | 13.2 | 2.9 | 4.1 | 118 | 307 | 1.5 | 0.12 | 0.56 | 0.21 | 2.5 |
| Jew's ear | Mu-erh | Auricularia auriculae-judae (Schroet) | 15.5 | 6.9 | 1.6 | 357 | 201 | 185.0 | 0.03 | 0.34 | 0.62 | 8.0 |
| Job's tears | I mi | Coix lacryma Jobi L. | 14.7 | 1.7 | 2.1 | 21 | 52 | 0.4 | 0.03 | 0.41 | 0.10 | 2.3 |
| Lettuce | Wo chü chi'ng | Lactuca sativa L. | 81.4 | 1.2 | 1.1 | 15 | 24 | 1.5 | 0.00 | 0.06 | 0.02 | 0.1 |
| Lily blossom, yellow day | Chin chen hua | Hemerocallis flava L. | 23.2 | 4.3 | 1.3 | 463 | 173 | 16.5 | 0.14 | 0.24 | 0.37 | 3.5 |
| Lily bulb, dried | Pai-ho (kan) | Lilium tigrinum Ker-Gawl | 14.2 | 2.8 | 0.9 | 53 | 122 | 1.8 | 0.00 | 0.13 | 0.05 | 1.0 |
| Maltose, crude | Mei ya tang | | 20.4 | 0.8 | 0.2 | 37 | 85 | 6.0 | 0.00 | 0.13 | 0.20 | 4.5 |
| Mung bean starch, jelly strip | Fen tiao | Phaseolus Mungo L. | 19.7 | 0.1 | 0.1 | 19 | 6 | 1.6 | 0.00 | 0.00 | 0.04 | 0.1 |
| Mung bean sprouts | Lü tou ya | Phaseolus Mungo L. | 79.2 | 0.9 | 0.9 | 33 | 90 | 1.7 | 0.02 | 0.20 | 0.92 | 0.5 |
| Muskmelon | Tsai kua | Cucumis melo var. conomon makino | 96.8 | 0.5 | 0.1 | 40 | 6 | 0.9 | 0.00 | 0.00 | 0.08 | 0.1 |
| Mustard root, pickled | Cha ts'ai | Brassica juncea (L.) Coss | 72.8 | 17.2 | 0.7 | 163 | 76 | 6.7 | 0.05 | 0.09 | 0.15 | 0.9 |
| Onion, fragrant | Chiu ts'ai | Allium odorum L. | 67.7 | 1.3 | 0.4 | 99 | 58 | 3.0 | 0.10 | 0.06 | 0.11 | 0.9 |
| Onion, Welsh | Tsung | Allium fistulosum L. | 64.5 | 1.2 | 0.2 | 66 | 57 | 6.4 | 0.02 | 0.08 | 0.07 | 0.5 |

TABLE 1—*Concluded*

| AMERICAN NAME | CHINESE NAME | BOTANICAL NAME | WATER | ASH | NITROGEN | CALCIUM | PHOSPHORUS | IRON | CAROTENE | THIAMINE | RIBOFLAVIN | NIACIN |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | *gm./100 gm.* | *gm./100 gm.* | *gm./100 gm.* | *mg./100 gm.* | *mg./100 gm.* | *mg./100 gm.* | *mg./100 gm.* | *mg./100 gm.* | *mg./100 gm.* | *mg./100 gm.* |
| Orange, sweet | Kuang kan | Citrus sinensis (L.) Osbeck | 63.9 | 0.8 | 1.0 | 47 | 25 | 0.9 | 0.02 | 0.05 | 0.03 | 0.3 |
| Orange, tangerine | Chü tzu | Citrus nobilis var. deliciosa (Ten.) Swingle | 83.1 | 0.2 | 1.2 | 26 | 13 | 0.1 | 0.02 | 0.05 | 0.02 | 0.3 |
| Pea | Wan tou | Pisum sativum L. | 12.2 | 2.4 | 6.9 | 57 | 225 | 1.1 | 0.11 | 1.11 | 0.03 | 3.7 |
| Pea starch jelly | Wan tou liang fen | | 89.8 | 0.4 | 0.5 | 12 | 214 | 1.3 | 0.02 | 0.10 | 0.02 | 0.0 |
| Peanut | Hua sheng jen | Arachis hypogaea L. | 20.1 | 1.9 | 4.0 | 87 | 309 | 1.6 | 0.04 | 1.12 | 0.11 | 14.7 |
| Persimmon | Shih tau | Diospyros kaki L. | 87.7 | 0.5 | 0.1 | 7 | 29 | 0.6 | 0.15 | 0.02 | 0.01 | 0.2 |
| Potherb mustard | Hsueh li hung | Brassica juncea var. crispifolia (Bailey) | 61.8 | 2.2 | 1.2 | 82 | 60 | 2.1 | 0.00 | 0.08 | 0.12 | 0.6 |
| Pummels | Yu tzu | Citrus maxima (Burm.) Merrill | 69.2 | 1.0 | 0.1 | 31 | 10 | 0.7 | 0.00 | 0.00 | 0.03 | 0.5 |
| Pumpkin | Wo kua (Nan kua) | Cucurbita moschata Duchesne | 94.6 | 0.9 | 0.1 | 34 | 21 | 1.2 | 0.00 | 0.02 | 0.04 | 0.5 |
| Rice, glutinous | No mi | Oryza glutinosa Lour. | 15.1 | 0.5 | 3.2 | 13 | 74 | 2.3 | 0.00 | 0.12 | 0.05 | 1.9 |
| Rice, fermented | Chiu niang (Lao tsao) | | 58.7 | 4.2 | 0.7 | 13 | 13 | 8.1 | 0.01 | 0.05 | 0.11 | 1.5 |
| Rice, third grade | San hao pai mi | Oryza sativa L. | 15.6 | 1.0 | 3.0 | 16 | 82 | 1.7 | 0.01 | 0.16 | 0.06 | 3.4 |
| Soybean, cheese | Ch'ou tou fu lu | | 79.8 | 12.5 | 2.3 | 303 | 222 | 4.1 | 0.05 | 0.00 | 0.14 | 0.5 |
| Soybean, curd | Tou fu | | 88.6 | 1.0 | 1.5 | 75 | 102 | 2.1 | 0.00 | 0.05 | 0.03 | 0.7 |
| Soybean, curd, fermented | Tou fu lu | | 64.4 | 20.9 | 1.9 | 214 | 174 | 3.3 | 0.06 | 0.01 | 0.12 | 0.6 |
| Soybean curd sheet | Ts'ian chang tou fu | | 45.3 | 1.8 | 5.2 | 284 | 291 | 0.7 | 0.00 | 0.07 | 0.10 | 0.0 |
| Soybean, curd, smoked | Tou fu kan | | 50.3 | 3.1 | 3.2 | 571 | 182 | 3.9 | 0.00 | 0.04 | 0.02 | 0.1 |
| Soybean, fermented | Tou chi | | 53.2 | 16.0 | 2.2 | 130 | 183 | 4.2 | 0.07 | 0.00 | 0.41 | 1.1 |
| Soybean, milk clot (oil skin) | Yu pi | | 20.4 | 2.3 | 6.8 | 319 | 179 | 0.3 | 0.06 | 0.31 | 0.18 | 0.2 |
| Soybean, sprouts | Huang tou ya | | 57.0 | 1.3 | 1.6 | 126 | 107 | 0.4 | 0.06 | 0.22 | 0.09 | 0.8 |
| Soybean, yellow (dried) | Ta tou | Glycine Max. Merr. | 11.5 | 4.5 | 5.7 | 333 | 466 | 3.6 | 0.03 | 1.25 | 0.15 | 2.5 |
| Soybean, yellow (fresh) | Mao tou | Glycine Max. Merr. | 45.1 | 2.9 | 4.1 | 44 | 223 | 3.3 | 0.06 | 0.40 | 0.30 | 1.3 |
| Vegetable sponge | Sze kua | Luffa cylindrica Roem. | 94.0 | 0.6 | 0.0 | 25 | 20 | 0.1 | 0.00 | 0.02 | 0.04 | 0.4 |
| Vermicelli, wheat flour | Kua mian | | 20.9 | 7.1 | 3.1 | 35 | 76 | 1.8 | 0.04 | 0.06 | 0.00 | 0.9 |
| Wheat—strain: N.A.R.B. No. 28 | Chung-nun hsiao mai 28 | Triticum vulgare Vill. | 29.2 | 1.8 | 2.0 | 25 | 295 | 0.5 | 0.04 | 0.33 | 0.12 | 6.3 |
| Wheat flour | Mian fen | | 11.8 | 0.8 | 1.4 | 43 | 90 | 3.0 | 0.02 | 0.20 | 0.06 | 1.9 |
| Yam | Chiao p'an shao | Dioscorea Batatas Deone | 60.0 | 0.8 | 0.2 | 18 | 21 | 1.2 | 0.00 | 0.09 | 0.07 | 0.5 |

other foods high in iron were: yellow day lily blossom, 16.5; fermented rice, 8.1; egg yolk, 7.4; mustard root, 6.7; Welsh onions, 6.4; and maltose, 6.0. The high iron content of Jew's ear has been confirmed by the method of the Association of Official Agricultural Chemists (3). The availability of the iron in these foods has not yet been confirmed.

### *Carotene*

All of these samples were low in carotene content. Possibly the diet of many Chinese is deficient in vitamin A or carotene. However, in some parts of China, especially Hunan, Szechuan, Yunan, and Kweichow provinces, a large quantity of hot pepper is consumed; and Cravioto *et al.* (11) have reported that the carotene content of the Mexican dry chili ranges from 5 to 57 mg. (equivalent to 8200 and 95,000 I.U. vitamin A) per 100 gm. Thus, people from these provinces may have sufficient pro-vitamin A.

### *Thiamine*

Only a few foods were rich in thiamine content (expressed in milligrams per 100 gm.): fresh yellow soybeans, 1.25; peanuts, 1.12; peas, 1.11; and red cowpeas, 1.09. All other samples had less than 0.6 mg. per 100 gm. and some had none. The few foods which were rich in thiamine content are not important in the Chinese diet.

### *Riboflavin*

Few of the foods contained more than 0.2 mg. of riboflavin per 100 gm. of sample: mung bean sprouts, 0.92; Jew's ear, 0.62; sweet apricot kernels, 0.49; fermented soybeans, 0.41; yellow day lily blossoms, 0.37; fresh yellow soybeans, 0.30; chestnuts, 0.22; horse beans, 0.21; and maltose, 0.20. All other samples contained almost negligible amounts of riboflavin.

### *Niacin*

The foods richest in niacin (expressed in milligrams per 100 gm.) were: peanuts, 14.7; Jew's ears, 8.0; wheat N.A.R.B. No. 28, 6.3; maltose, 4.5; peas, 3.7; yellow day lily blossoms, 3.5; third grade rice, 3.4; corn, 2.6; dried yellow soybeans, 2.5; horse beans, 2.5; Job's tears, 2.3; and red cowpeas, 2.1.

### *General Considerations*

The differences in the vitamin and mineral content of the soybean and its products are notable. The processing reduced the thiamine and niacin content while it increased the calcium content. In all cases in which the calcium content was increased, calcium had been added during the manufacture. This was true also of mung bean sprouts and mung bean starch jelly strip.

Jew's ear was one of the most nutritious foods analyzed. It contained considerable amounts of protein, iron, calcium, and niacin. Yellow day lily blossoms may be considered to be the next important food, especially because of their high iron and calcium content and their favorable calcium/phosphorus ratio. Soybeans and soybean products (notably yellow soybeans and smoked soybean curd) were the highest in calcium content. Peas, horse beans, kidney beans, sweet apricot kernels, and peanuts are also especially valuable foods.

## CONCLUSION

The results of the analyses of fifty-six Chinese foods and food products for moisture, ash, nitrogen, calcium, phosphorus, iron, carotene, thiamine, riboflavin, and niacin content are reported.

No general conclusions regarding Chinese foods can be drawn from these analyses. Many more samples must be analyzed before this is warranted. It is evident, however, that there are several especially nutritious foods in the Chinese dietary. A careful and complete program for the analysis of all edible plants in China is urgently needed.

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## GLOSSARY

| English | Chinese | |
|---|---|---|
| Apricot kernel (sweet) | 杏仁(甜) | Hsing jen (Tian) |
| Bamboo, water | 茭白 | Chiao pai |
| Bean, flat (fresh) | 扁豆(鮮) | Pien tou (Hsien) |
| Bean, kidney | 菜豆 | Ts'ai tou |
| Cabbage, swamp | 空心菜 (蕹菜) | Kung hsin ts'ai (Wung ts'ai) |
| Cabbage, white mustard | 小白菜 | Hsiao pai ts'ai |
| Carrot tops (wild) | 蘿蔔菜 | Lofu ts'ai |
| Chestnut | 栗子 | Li tzu |
| Corn | 玉米 | Yü mi |
| Cowpea with pods | 豇豆莢 | Chiang tou chia |
| Cowpea, red | 紅豇豆 | Hung ch'iang tou |
| Eggplant | 茄子 | Ch'ieh tze |
| Eggs, duck, limed | 皮蛋(松花) | Pitan (Sung-hua) |
| Gourd, bitter | 苦瓜 | K'u kua |
| Gourd, white | 冬瓜 | Tung kua |
| Horse bean, dried | 蠶豆(乾) | Ts'an tou (kan) |
| Jew's Ear | 木耳 | Mu-erh |
| Job's tears | 薏米 | I mi |
| Lettuce | 萵苣菜 | Wo chü chi'ng |
| Lily blossom, yellow day | 金針花 | Chin chen hua |
| Lily bulb, dried | 百合(乾) | Pai-ho(kan) |
| Maltose, crude | 麥芽糖 | Mei ya tang |
| Mung bean starch, jelly strip | 粉條 | Fen tiao |
| Mung bean sprouts | 綠豆芽 | Lü tou ya |
| Muskmelon | 菜瓜 | Tsai kua |
| Mustard root, pickled | 榨菜 | Cha ts'ai |
| Onion, fragrant | 韮菜 | Chiu ts'ai |
| Onion, Welsh | 葱 | Tsung |
| Orange, sweet | 廣柑 | Kuang kan |
| Orange, tangerine | 橘子 | Chü tzu |
| Pea | 豌豆 | Wan tou |
| Pea starch jelly | 豌豆涼粉 | Wan tou liang fen |
| Peanut | 花生仁 | Hua sheng jen |
| Persimmon | 柿子 | Shih tau |
| Potherb mustard | 雪裡紅 | Hsueh li hung |
| Pummels | 柚子 | Yu tzu |

GLOSSARY, cont'd.

| English | | | Chinese |
|---|---|---|---|
| Pumpkin | 倭瓜 | (南瓜) | Wo kua (Nan kua) |
| Rice, glutinous | | 糯米 | No mi |
| Rice, fermented | 酒釀 | (老糟) | Chiu niang (Lao tsao) |
| Rice | | 三號白米 | San hao pai mi |
| Soybean cheese | | 臭豆腐乳 | Ch'ou tou fu lu |
| Soybean curd | | 豆腐 | Tou fu |
| Soybean curd, fermented | | 豆腐乳 | Tou fu lu |
| Soybean curd sheet | | 千張豆腐 | Ts'ian chang tou fu |
| Soybean curd, smoked | | 豆腐乾 | Tou fu kan |
| Soybean, fermented | | 豆豉 | Tou chi |
| Soybean, milk clot (oil skin) | | 油皮 | Yu pi |
| Soybean sprouts | | 黃豆芽 | Huang tou ya |
| Soybean, yellow (dried) | | 大豆 | Ta tou |
| Soybean, yellow (fresh) | | 毛豆 | Mao tou |
| Vegetable sponge | | 絲瓜 | Sze kua |
| Vermicelli, wheat flour | | 掛麵 | Kua mian |
| Wheat, Strain N.A.R.B. No. 28 | | 中農小麥 | Chung-nun hsiao mai 28 |
| Wheat flour | | 麵粉 | Mian fen |
| Yam, flat | | 腳板薯 | Chiao p'an shao |

### *Cost of Carelessness*

In his November 26 News Letter on Food Distribution Programs Branch Activities, Oscar F. Beyer, Area Field Supervisor of the Production and Marketing Administration, Department of Agriculture, Chicago, gives this graphic illustration of the cost of carelessness. He says that it was recounted at the recent meeting of the School Food Service Association in Detroit.

"When we say that food costs can be controlled by using tested recipes, we assume that the tested recipes will be followed exactly. Look what happened to a tested recipe that was posted for use but not followed:

"The tested recipe was for cream of mushroom soup. It called for 168 servings at a food cost of 7.2 cents per serving or a total cost of $12.10. What happened?

(a) The cook weighed out the mushrooms and found she had a few pounds left, so she threw them in—for good measure.

(b) In getting goods ready for the preparation of the soup, she didn't get enough milk from the ice box, so she filled out the measure with cream.

(c) For the inexpensive cooking fat, she substituted butter—because it was handy.

"After the soup was prepared, the manager discovered that they were short on cream, butter, and later on mushrooms. The cook explained why she had changed the recipe.

"The costs were figured to show all cooks why they should follow recipes. For 168 servings, the food cost was 9.5 cents per serving, or $16 total cost. This was an increase of 2.3 cents per serving, caused by carelessness.

"This same increase can happen when we *think we can remember* HOW MUCH to use and WHAT to use. Think what food costs would be if the same cook prepared one more dish for that lunch!"

# Effect of Electronic Cooking on Nutritive Value of Foods[1]

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RADIO frequency heating, also known as electronic, dielectric, or high frequency heating, has attained an important position in the food industry. Because of the many possible applications of electronic heating, it was of interest to determine what beneficial or destructive effects this process might have on nutrients. Moyer *et al.* (1) and Proctor (2) have reported tremendous savings of nutrients when electronic blanching was employed. It thus appeared reasonable to expect significant savings of nutrients with this method of cooking.

## EXPERIMENTAL PROCEDURE

Retention of nutrients was determined in the preparation of commonly used meats and vegetables, namely, beef patties, pork patties, beef roasts, cabbage, carrots, broccoli, and potatoes. These foods were cooked by electronic heat employing the electronic range described by Proctor (2). Similar samples were prepared simultaneously by conventional methods, such as boiling, pressure cooking, and baking for vegetables and grilling and roasting for meat. Since the capacity of the electronic equipment used was limited, only the effect of small scale preparation on nutrient retention could be tested. The detailed cooking procedure as well as the description of the resulting products and the palatability have been described in a separate paper (3).

### *Preparation of Samples*

*Beef Patties.* Standard Army size patties weighing 100 to 108 gm. were made from a homogeneous ground meat mixture. An individual patty was placed in a beaker and cooked[3] in the electronic range in 70 seconds. Five such cooked patties were chopped and a 200-gm. sample of the mixture was used to prepare a slurry from which aliquots were taken for thiamine, riboflavin, and niacin assay. The recoverable juices exuding from the patties were measured and combined, and samples were also taken for assay of these vitamins. Three replicate analyses of the meat and juices were made.

To test the effect of increasing the oven load on the cooking time and nutritive retention, six patties were simultaneously cooked (4 min.) in the electronic range. These patties and juices were then combined and treated for assay as described above.

Six patties of standard Army size were then grilled on an electric oven for 20 to 30 min. Juices could not be recovered by this technique. Sampling and the number of analyses were as described above.

*Pork Patties.* The preparation and analysis of this sample were the same as for beef patties. The cooking time for individual patties in the electronic range was 85 seconds, and for six patties cooked simultaneously, 5 min. The time required to grill pork patties to an internal temperature of 175° F. was 25 to 30 min. Analysis was made of the juice for thiamine only.

*Beef Roasts.* Paired boned roasts were used as the raw and cooked samples. Roasts were cut from the seventh and eighth ribs, ninth and tenth ribs, and eleventh and twelfth ribs, respectively, boned, and trimmed to weigh 3 to 4 lb. The cooking time to

[1] This paper reports research undertaken by the Quartermaster Food and Container Institute for the Armed Forces, and has been assigned number 213 in the series of papers approved for publication. The views or conclusions contained in this report are those of the authors. They are not to be construed as necessarily reflecting the views or indorsement of the Department of the Army. Received for publication August 14, 1948.

[2] The authors wish to express appreciation to Marion Bollman, Lois Gordon, and Mary Lambert of the Experimental Cookery Branch, Quartermaster Food and Container Institute of the Armed Forces, for the preparation of the samples. Grateful acknowledgment is also made to Drs. G. H. Berryman, H. L. Fevold, and H. D. Lightbody for their interest in the work.

[3] Cooking was considered complete when an internal temperature of approximately 160°F. was reached.

obtain an internal temperature of 165°F. averaged 13 min. in the electronic range and 121 min. in the oven. Six replicate cookings were made by electronic cooking and by oven roasting. The whole roast was ground, a homogeneous mixture obtained, and a 200-gm. sample used for a slurry. Meat and juices were assayed as previously described.

*Cabbage.* Trimmed heads of cabbage of approximately equal weight were quartered, the excess core removed, and representative quarters from each head employed for the four batches (the raw, electronically cooked, boiled, and pressure-cooked samples[4]). Each sample batch weighed approximately 350 to 400 gm. (average weight 352 gm.). Ascorbic acid, thiamine, and riboflavin determinations were made on water and solids. Nine to twelve replicate cookings were made for each method of preparation[5].

*Carrots.* Selected carrots of approximately equal size were scraped, quartered, and one quarter from each carrot used for each of the batches respectively. Samples averaged 225 gm. (range, 220 to 260 gm.). Assays of water-soluble vitamins were made on the solids and cooking water. Carotene determinations were made on the solids only.

*Broccoli.* Due to the difference in cooking time of the flowerlets and stalks, the cooking experiments were conducted on the flowerlet portion containing about 2 in. of stalk. Flowerlets from the same stalk were distributed in each of the four batches. The weight of the sample ranged from 290 to 320 gm., averaging 300 gm. Ascorbic acid, thiamine, and riboflavin assays were conducted on the solid and liquid portions. Carotene assays were made on the solid only.

*Potatoes.* Retention of nutrients was determined in both boiled and baked potatoes. For the boiled potatoes, McClure variety was used. Potatoes weighing 60 to 75 gm. were peeled, quartered, and one quarter used for each batch. The total sample cooked averaged 380 gm. The solid and liquid portions were assayed for ascorbic acid and thiamine.

For baked potatoes, Idaho potatoes in the jacket averaging 187 gm. were baked individually for 2 min. by electronic heat to an internal temperature ranging from 185° to 210°F. Five baked potatoes were then combined for assay. Three replicate analyses were made for thiamine and ascorbic acid. As in the case with meat patties, the effect of increasing the number of potatoes cooked simultaneously was also investigated. Six potatoes were baked simultaneously (8 min.) for this purpose.

Potatoes with jackets were also baked in the electric oven for 45 min. Sampling and the number of analyses were as described above.

[4] The raw sample and the three methods of cooking will be referred to hereafter as the four batches.

[5] Unless otherwise specified, nine to twelve replicate cookings were employed in the vegetable studies.

### *Method of Analysis*

The 200-gm. representative sample for the various foods was blended with an equal weight of stabilizing solution in a Waring Blendor (0.1 N sulphuric acid, for the B vitamins, 10 per cent metaphosphoric acid for ascorbic acid, and 1 to 12 per cent alcoholic potassium hydroxide for carotene) and an aliquot of the blends was used for the respective assays. Drippings from the meat and the drained liquid from the vegetables were made to volume with the respective stabilizing solutions prior to assay. Reduced ascorbic acid determinations were made by the indophenol method as outlined by Loeffler and Ponting (4). Total ascorbic acid was made according to Roe's phenylhydrazine method (5). Thiamine was determined by the thiochrome method (6) and riboflavin by the fluorometric method (7). The niacin content was determined by a modified Dann and Handler technique (8). Carotene was determined by the chromatographic method (9). The amount of each vitamin in a sample and the retentions were calculated on the basis of the batch weight (10).

## RESULTS

### *Meat*

Results of the experiments with meats are shown in Table 1.

*Niacin.* There was no significant difference in the retention of niacin for the different cooking methods tested for the preparation of beef patties, pork patties, and beef roasts. The niacin retention in beef patties was approximately 90 per cent and in pork patties approximately 85 per cent. Additional niacin—6 to 20 per cent—was found in the juices, the larger amount being recovered in the juices exuding from beef patties cooked six at a time in the electronic range. Rib roast of beef retained 81 per cent of the niacin when cooked in the oven and 73 per cent when cooked electronically, with an additional 10 to 15 per cent being recovered in the drippings. It was interesting to note that despite the large difference in amount of juice exuded in the two methods (90 to 173 cc. for the roast cooked in the oven as against 250 to 281 cc. for that cooked in the electronic range), the amount of niacin recovered in the larger quantity of juice (from the electronic range) was not proportionally greater.

*Riboflavin.* There was no appreciable difference in the retention of riboflavin when beef patties and pork patties were cooked by electronic heat and on a grill. The retention was approximately 100 per cent for both methods. As in the case of niacin, approximately twice as much riboflavin was recovered in the juice from the longer cooking periods in which six patties were cooked simultaneously, bringing the retention well over 100 per cent. The retention of riboflavin in the roasts was approxi-

TABLE 1

*Comparison of retention of nutrients in meats prepared by electronic and conventional cooking methods*

| METHOD OF COOKING | NIACIN RETENTION | | | | | | RIBOFLAVIN RETENTION | | | | | | THIAMINE RETENTION | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Solid | | | Liquid | | | Solid | | | Liquid | | | Solid | | | Liquid | | |
| | Range | Average | Standard deviation | Range | Average | Standard deviation | Range | Average | Standard deviation | Range | Average | Standard deviation | Range | Average | Standard deviation | Range | Average | Standard deviation |
| **Beef patties** | | | | | | | | | | | | | | | | | | |
| | % | % | | % | % | | % | % | | % | % | | % | % | | % | % | |
| Electronic range | | | | | | | | | | | | | | | | | | |
| Single | 92–95 | 93 | 1.6 | 6– 7 | 6 | 0.7 | 97–108 | 103 | 5.5 | 7– 8 | 7 | 0.7 | 87–94 | 89 | 4.1 | 7–9 | 8 | 1.0 |
| Multiple | 79–97 | 89 | 9.1 | 19–22 | 20 | 1.7 | 94–101 | 99 | 5.6 | 18–18 | 17 | 0.7 | 72–83 | 77 | 5.7 | 18–20 | 19 | 1.7 |
| Grilled | 86–96 | 91 | 7.0 | | | | 103–109 | 105 | 3.2 | | | | 48–65 | 55 | 8.9 | | | |
| **Pork patties** | | | | | | | | | | | | | | | | | | |
| Electronic range | | | | | | | | | | | | | | | | | | |
| Single | 84–95 | 90 | 5.5 | | | | 91–107 | 99 | 8.0 | | | | 88–94 | 91 | 3.0 | 1–2 | 2 | 0.7 |
| Multiple | 76–86 | 81 | 5.1 | | | | 86– 89 | 87 | 1.7 | | | | 90–92 | 91 | 1.0 | 12–14 | 13 | 1.0 |
| Grilled | 79–87 | 84 | 4.6 | | | | 96–107 | 102 | 5.5 | | | | 75–82 | 79 | 3.8 | | | |
| **Beef roasts** | | | | | | | | | | | | | | | | | | |
| Electronic range | | | | | | | | | | | | | | | | | | |
| 7th and 8th ribs | 66–78 | 72 | | 12–12 | 12 | | 78– 82 | 80 | | 3– 5 | 4 | | 50–70 | 60 | | 10–12 | 11 | |
| 9th and 10th ribs | 72–72 | 72 | | 11–13 | 12 | | 74– 89 | 82 | | 3– 4 | 3 | | 55–78 | 67 | | 8– 9 | 8 | |
| 11th and 12th ribs | 70–82 | 76 | | 10–13 | 12 | | 88– 91 | 90 | | 3– 5 | 4 | | 59–66 | 63 | | 5–11 | 8 | |
| Average | | 73 | | | 12 | | | 84 | | | 4 | | | 63 | | | 9 | |
| Electric oven | | | | | | | | | | | | | | | | | | |
| 7th and 8th ribs | 82–83 | 83 | | 14–16 | 15 | | 95–112 | 104 | | 2– 7 | 4 | | 75–75 | 75 | | | 7 | |
| 9th and 10th ribs | 68–87 | 78 | | 17–19 | 18 | | 78– 78 | 78 | | 3– 8 | 6 | | 67–68 | 68 | | 6– 7 | 6 | |
| 11th and 12th ribs | 77–89 | 83 | | 8–13 | 11 | | 85– 93 | 89 | | 2– 4 | 3 | | 80–81 | 81 | | 6– 7 | 6 | |
| Average | | 81 | | | 15 | | | 90 | | | 4 | | | 75 | | | 6 | |

mately 85 per cent for both methods of cooking with an additional 4 per cent in the drippings.

*Thiamine.* Thiamine retention in pork patties was not as greatly affected by the method of cooking (cooking time) as it was in beef patties.

Retention in pork patties cooked electronically was 90 per cent regardless of whether one or six patties were cooked. As previously noted for niacin and riboflavin, more thiamine was recovered in the juice exuding from six patties cooked simultaneously (13 per cent retention) than in the juice from one patty (2 per cent retention). Retention of thiamine by grilling was 80 per cent.

In the case of beef patties, the loss of thiamine by the different cooking procedures was more striking. The grilled beef patties retained only 55 per cent of the original thiamine concentration, whereas those cooked singly in the electronic range retained 89 per cent, and those cooked simultaneously retained 77 per cent. Twice as much thiamine was retained in the juice from the beef patties cooked 4 min.

On the whole, the retention of thiamine was better in the oven roasts than in the electronically-cooked roasts. The thiamine retention averaged 75 per cent for the oven roasts and 63 per cent for the roasts cooked in the electronic range. The amount of thiamine recovered in the juice ranged from 6 to 9 per cent for both methods.

### *Vegetables*

Results of the assays for nutrients in vegetables are recorded in Tables 2 and 3.

*Total Ascorbic Acid.* It can be seen that in no case was the electronic range method of cooking appreciably better than the boiling or pressure method for retaining ascorbic acid in vegetables. Broccoli, when cooked electronically, retained 64 per cent of the original ascorbic acid, whereas 72 per cent was retained in the pressure-cooked sample and 60 per cent in the boiled sample. In the cabbage cooked by pressure, electronic heat, and boiling, retention of ascorbic acid was 71, 59, and 42 per cent respectively. When carrots were cooked by electronic heat, boiled, and by pressure, they retained 83, 80, and 77 per cent ascorbic acid respectively.

The retention of ascorbic acid in boiled potatoes was much greater than for baked potatoes. In the boiled potatoes cooked in the pressure cooker, electronic range, and saucepan, retention was 86, 81, and 76 per cent respectively. Only 52 per cent was retained in

TABLE 2

*Comparison of retention of carotene and ascorbic acid in vegetables cooked by electronic heat and conventional methods*

| METHOD OF COOKING | AMOUNT OF COOKING WATER | COOKING TIME | CAROTENE RETENTION IN SOLIDS | | | ASCORBIC ACID RETENTION | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Total | | | | | | |
| | | | | | | Solid | | | Liquid | | | Average reduced ascorbic acid in solid |
| | | | Range | Average | Standard deviation | Range | Average | Standard deviation | Range | Average | Standard deviation | |
| **Broccoli** | | | | | | | | | | | | |
| | *gm.* | *min.* | % | % | | % | % | | % | % | | % |
| Electronic range | 450 | 5½ | 104–169 | 125 | 19.5 | 54– 71 | 64 | 5.6 | 16–30 | 23 | 4.6 | 66 |
| Boiled | 450 | 7 | 79–151 | 130 | 22.7 | 48– 72 | 60 | 7.0 | 20–29 | 25 | 3.2 | 61 |
| Pressure cooked | 70 | ⅝ | 103–178 | 129 | 24.4 | 61– 79 | 72 | 6.9 | 4– 7 | 6 | 1.02 | 73 |
| **Cabbage** | | | | | | | | | | | | |
| Electronic range | 690 | 6 | | | | 47– 67 | 59 | 7.9 | 22–36 | 31 | 7.6 | 57 |
| Boiled | 690 | 15 | | | | 35– 52 | 42 | 5.8 | 29–45 | 37 | 6.5 | 39 |
| Pressure cooked | 70 | 1¼ | | | | 61– 77 | 71 | 6.1 | 6–17 | 10 | 6.0 | 63 |
| **Carrots** | | | | | | | | | | | | |
| Electronic range | 110 | 2¼ | 77–216 | 118 | 36.9 | 73– 90 | 83 | 6.7 | 11–18 | 15 | 2.1 | 81 |
| Boiled | 130 | 9 | 88–206 | 121 | 30.9 | 70– 89 | 80 | 6.0 | 8–15 | 10 | 2.2 | 73 |
| Pressure cooked | 70 | 1 | 96–178 | 120 | 30.0 | 70– 87 | 77 | 6.9 | 10–16 | 13 | 2.1 | 67 |
| **Potatoes** | | | | | | | | | | | | |
| Boiled | | | | | | | | | | | | |
| Electronic range | 450 | 6 | | | | 61–111 | 81 | 15.0 | 9–15 | 13 | 2.1 | 93 |
| Saucepan | 450 | 18 | | | | 53– 93 | 76 | 11.8 | 16–22 | 18 | 2.3 | 88 |
| Pressure cooked | 100 | 9 | | | | 69–105 | 86 | 12.2 | 3– 8 | 5 | 1.4 | 91 |
| Baked | | | | | | | | | | | | |
| Electronic range | | | | | | | | | | | | |
| Single | | 2 | | | | 42– 70 | 50 | 10.1 | | | | |
| Multiple | | 8 | | | | 47– 68 | 53 | 8.4 | | | | |
| Electric oven | | 39 | | | | 40– 54 | 47 | 4.6 | | | | |

the potatoes baked singly or simultaneously in the electronic range and 47 per cent when baked in the oven.

As can also be seen in Table 2, a significant amount of ascorbic acid was extracted in the cooking water from the boiling and electronic methods of cooking. In the case of broccoli, 25 per cent was found in the water; of cabbage, 22 to 33 per cent. However, for potatoes and carrots, the amount of ascorbic acid found in the liquid was not appreciably different for the three methods of cooking, the retentions found in the water ranging from 10 to 15 per cent for the carrots and 5 to 18 per cent for potatoes.

*Carotene.* Carrots and broccoli showed 20 to 30 per cent "increases" in carotene content following cooking, with no appreciable difference in the cooking methods tested.

*Riboflavin.* When carrots were cooked by the three methods, the results were practically the same; 90 per cent retention of riboflavin for the boiling method and 93 per cent retention for the other two methods. However, in the case of broccoli and cabbage, the pressure-cooked sample retained appreciably more riboflavin than either of the other two methods. Broccoli retained 94 per cent riboflavin in the pressure-cooked sample and 70 per cent in the other samples. When the cooking water was included, all methods were equally good, having a retention of 102 per cent. In the cabbage, riboflavin retention was found to be 95 per cent in the pressure-cooked sample, 69 per cent in the electronically cooked sample, and 61 per cent in the boiled sample. If the cooking water were included, the retention figures were 92, 96, and 87 per cent respectively for the boiling, pressure, and electronic methods of cooking.

*Thiamine.* Broccoli and cabbage, when cooked by pressure, retained 90 per cent of the original thiamine concentration. This value is appreciably higher than the retention values for the other two methods. Broccoli retained only 75 per cent thiamine by the boiling and electronic methods. Cabbage retained a still smaller amount—53 per cent for the boiling method and 62 per cent for the electronic method. If the cooking water were included, retention with all methods was approximately 100 per cent.

TABLE 3

*Comparison of retention of riboflavin and thiamine in vegetables cooked by electronic heat*

| METHOD OF COOKING* | RIBOFLAVIN RETENTION | | | | | | THIAMINE RETENTION | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Solid | | | Liquid | | | Solid | | | Liquid | | |
| | Range | Average | Standard deviation | Range | Average | Standard deviation | Range | Average | Standard deviation | Range | Average | Standard deviation |
| **Broccoli** | | | | | | | | | | | | |
| | % | % | | % | % | | % | % | | % | % | |
| Electronic range | 55– 84 | 71 | 9.7 | 26–43 | 31 | 6.5 | 67– 85 | 76 | 6.2 | 20–38 | 31 | 5.5 |
| Boiled | 54– 80 | 69 | 8.3 | 26–42 | 33 | 6.0 | 65– 89 | 75 | 8.5 | 26–39 | 33 | 3.8 |
| Pressure cooked | 80–108 | 94 | 10.0 | 7–11 | 8 | 1.5 | 67–103 | 90 | 11.4 | 7–10 | 8 | 1.1 |
| **Cabbage** | | | | | | | | | | | | |
| Electronic range | 54– 82 | 69 | 8.7 | 13–24 | 19 | 5.6 | 50– 73 | 62 | 7.2 | 40–48 | 42 | 4.7 |
| Boiled | 40– 75 | 61 | 10.1 | 33–39 | 35 | 3.5 | 46– 62 | 53 | 5.1 | 47–58 | 52 | 4.1 |
| Pressure cooked | 76–112 | 95 | 8.6 | 1– 2 | 2 | 0.2 | 69–107 | 88 | 11.4 | 3– 3 | 3 | 0.0 |
| **Carrots** | | | | | | | | | | | | |
| Electronic range | 73–104 | 93 | 9.0 | 8–14 | 11 | 1.6 | 82–105 | 91 | 8.6 | 11–17 | 14 | 2.1 |
| Boiled | 73–113 | 90 | 12.8 | 8–13 | 12 | 2.5 | 72–103 | 88 | 10.6 | 7–16 | 12 | 2.9 |
| Pressure cooked | 73–113 | 93 | 11.0 | 12–19 | 14 | 2.1 | 75– 99 | 85 | 7.0 | 12–24 | 15 | 3.4 |
| **Potatoes** | | | | | | | | | | | | |
| Boiled | | | | | | | | | | | | |
| Electronic range | | | | | | | 82– 99 | 91 | 6.2 | 7–16 | 10 | 3.0 |
| Saucepan | | | | | | | 74– 96 | 83 | 7.9 | 13–15 | 14 | 1.2 |
| Pressure cooked | | | | | | | 85–106 | 92 | 7.3 | 1– 5 | 3 | 1.2 |
| Baked | | | | | | | | | | | | |
| Electronic range | | | | | | | | | | | | |
| Single | | | | | | | 76– 91 | 86 | 5.9 | | | |
| Multiple | | | | | | | 77– 97 | 88 | 7.6 | | | |
| Electric oven | | | | | | | 78– 91 | 85 | 4.8 | | | |

* See Table 2 for quantity of water used in cooking and for cooking time.

No significant difference in thiamine retention for the different cooking methods could be observed in carrots. For the samples cooked in the saucepan, pressure cooker, and electronic range, the retention figures were 88, 85, and 91 per cent respectively, with 100 per cent retention in all cases if the cooking water were included.

Whether potatoes were baked or boiled, there was no appreciable difference in the cooking methods tested. Approximately 85 per cent thiamine was retained in all baked and boiled samples. In the cooking water from the potatoes cooked in the pressure cooker, there were only an additional 3 per cent present. However, 9 and 14 per cent were found in the cooking water from the electronic range and saucepan respectively.

## DISCUSSION

### *Meats*

*B-Complex.* This study reports no loss of riboflavin and 11 per cent loss of thiamine when beef patties are cooked in the electronic range. Proctor *et al.* (2) found 12 per cent loss of riboflavin and 4 per cent loss of thiamine when using this method of cooking for a 75-gm. beef patty cooked 60 seconds.

In some cases, there was poor agreement in vitamin retention between the replicate roasts cooked electronically, whereas assays of the replicate roasts cooked in the oven were in better agreement. Although it has been shown by Rice *et al.* (11) that there is just as much difference from muscle to muscle as from animal to animal, the writers feel that this is not the reason for the poor agreement in the samples cooked electronically, since this factor was common to both methods of cooking. In order to get the center of the roast to the desired internal temperature in the electronic range, it is necessary to over-cook and dehydrate the outside. It was noted that the shape and the weight of the roast, as well as the amount of fat contained in the roast were factors affecting the final product. Since no two roasts were exactly the same size and weight or contained the same amount of fat, it was almost impossible to duplicate the end product. This is believed

to be the reason for the difference in vitamin retention for replicate roasts cooked by dielectric heat.

An interesting observation was the apparent discrepancy in the quantity of water-soluble nutrients recovered in the large volume of juice produced in the electronic range as compared to that in the oven. The juice from meats cooked in the electronic range consisted of approximately 50:50 mixture of fat and water produced by a rapid surface dehydration and fat rendering, resulting in a hard brown crust. The formation of crust may have prevented further loss of tissue water with its accompaniment of water-soluble nutrients. That this may occur is borne out by the moist state and moderate degree of doneness observed in the interior of the roast. In the case of the patties, where greater surface area was exposed and cooking was more uniform due to greater heat penetration, increased nutrients were noted in the liquid exuding from the patties cooked six at a time (4 to 5 min.) as against those cooked singly (70 to 80 seconds).

### *Vegetables*

Both the amount of water used and the cooking time were factors found to affect retention of nutrients in the vegetables. In general, greater losses of water-soluble nutrients occurred through leaching in the boiling water and electronic range methods in which larger quantities of water were needed than in the pressure cooker. The decreased cooking time employed in the high frequency cooking also showed a tendency toward increased nutrient retention in the vegetables. However, the effect of the decreased cooking time was not as marked on the retention of nutrients as the effect of amount of cooking water (Tables 2 and 3).

The decreases noted in the ascorbic acid content following cooking were due to a combination of leaching and destruction. Losses by destruction were not appreciably compensated for by the formation of dehydroascorbic acid as is demonstrated in Table 2. Values for both reduced and total ascorbic acid were similar, indicating that the ascorbic acid lost in cooking was not recovered as the dehydroascorbic acid form but was oxidized beyond this stage. Similar results were obtained on large-scale cooking studies on cabbage, carrots, potatoes, and spinach by the Pentagon Nutrition Laboratory (10, 12–14).

The high retention values for carotene (approximately 120 to 130 per cent) have also been observed by others (15, 16). Two possible explanations are: (a) loss of carotene in the raw sample as a result of action of destructive enzymes during sampling prior to blending with stabilizing solution (15, 17, 18) and (b) greater difficulty in obtaining complete extraction of carotene in the raw as compared to the cooked state. A detailed discussion and evidence that the increase in carotene in cooking is apparent rather than actual is presented by Porter *et al.* (16).

SUMMARY

A study was conducted to compare the retention of nutrients in meats and vegetables when cooked by the usual cooking methods and by dielectric or electronic heat.

The cooking time and amount of water used were determining factors in retention of nutrients in vegetables. In the three cooking methods tested, the amount of water used had the greatest influence on the retention of water-soluble nutrients, the pressure cooking technique resulting in superior retention as compared to the boiling water and electronic range techniques.

Thiamine retention was higher in meat patties cooked by high frequency energy than in patties cooked by grilling. Niacin and riboflavin were equally stable in both methods of cooking.

Beef roasts showed slightly better retention of thiamine, riboflavin, and niacin when prepared in the oven than in the electronic range.

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### *If You Were Asked*

. . . And you *will* be asked about a dietitian's life by many a high school girl and by many a college girl who is teetering on the decision of a choice of careers. *Think about your answer!*

■ Would you tell her that during your internship your feet literally ached off (most of ours did)? . . . *Or*, would you tell her that it was the nicest tired feeling—one of inner satisfaction that in your small way you were contributing to the welfare of sick people?

■ Would you tell her that you were completely confused about diet therapy? . . . *Or*, would you tell her that interning is the true application of those four years of study, and that one finds that McLester, Proudfit, and Joslin knew their business?

■ Would you tell her that serving trays got to be a very boring duty? . . . *Or*, would you tell her about the just plain ecstasy felt when you (a small town college girl) served an appetizing tray to a patient who couldn't eat, but did on one look at "your" tray with "your" menu?

■ Would you tell her how your back almost broke at pouring formulas? . . . *Or*, would you tell her of the thrill in visiting the nursery and seeing those red, but lovable babies, then visiting their mothers who always had a bright and cheery smile and a nice "Good morning"?

■ Would you tell her how your patience almost ebbed away at the seemingly constant dumbness of the new ward maid? . . . *Or*, would you put a feather in your bonnet and tell her how you spent a half an hour of good down-to-earth explaining? The results were amazing—best maid in the place!

■ Would you tell her that the student nurses' questions almost drove you crazy? . . . *Or*, would you tell her that some of your best friends were student nurses, admitting that nurses were a great help in keeping your patients' data up to date?

■ Would you tell her that your first job was hard to learn? . . . *Or*, would you tell her that a new job holds a great thrill and anticipation that very seldom ends in anything but pleasant surprises?

■ Would you tell her that the days got long and boresome? . . . *Or*, would you tell her that each new day on duty was different and usually exciting?

■ Would you tell her that listening to patients' or patrons' complaints got old? . . . *Or*, would you tell her that from almost every complaint there is something new to be learned or a new suggestion of improvement to be made and after all that is your job?

ARE YOU LOYAL TO YOUR PROFESSION????

Remember that your answer to her questions is your own personal vocational guidance program! Does your conscience not prick a little, and do you not wonder if you have not sometimes been careless in your "shop" talk? To be a "good" dietitian is to be a "good" advertiser.—*Helen S. Glover, in the 1948 fall issue of The Mississippi Dietitian.*

# Effect of Food Supplements on Growth, Reproduction, and Lactation[1]

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EVALUATING the nutritive value of diets for reproduction and lactation of the rat has proved to be an exacting criterion. Recent investigations have revealed the need for pteroylglutamic (folic) acid (1, 2) and for unidentified factors when both purified and crude rations were fed (2–9). As a consequence of these studies, valuable information has been obtained on the adequacy of different food products as sources of known or unknown nutrients. The techniques employed in investigations of reproduction and lactation and recent studies on the existence of unknown factors have been reviewed previously (10).

In the present study the adequacy of diets composed principally of whole wheat and whole milk powder (11, 12) was studied. In addition, the effect of supplementing these diets with meat, casein, liver extract, or other materials on the growth, reproduction, and lactation performance was investigated.

## EXPERIMENTAL PROCEDURE AND RESULTS

### *Experiment 1*

The procedure used in these studies was described previously (10). Eight female rats, twenty-one days of age (Sprague-Dawley strain), were used in each group and were fed the experimental diets from weaning. They were bred at twelve weeks of age. Stock males were rotated among the different groups in each series at five-day intervals. After pregnancy was ascertained, the females were placed in individual cages. The young were counted and weighed at one day of age, and the number given to the female to raise was reduced to six at that time. The young and the females were weighed at weekly intervals, and the young were weaned at twenty-one days of age. The females were placed with the male immediately after the young were weaned, and this procedure was used for three successive litters.

In the first experiment, eight groups were used and fed the diets listed in Table 1. The two basal rations were composed of: (a) 16.7 per cent whole milk powder (Borden), 82.5 per cent whole wheat, and 0.8 per cent sodium chloride (Diet No. 100); and (b) 33.3 per cent whole milk powder, 66.0 per cent whole wheat, and 0.7 per cent sodium chloride (Diet No. 103). In these and all other diets, sodium chloride was added at a level of 1 per cent of the weight of the wheat. For Diet No. 101, 16.7 parts of the wheat were replaced isocalorically by meat (canned beef round). The caloric value was obtained from the proximate analysis data. This same amount of meat (11.4 parts, dry basis) was added at the expense of the entire ration in Diet No. 102.

Similar substitutions were made in basal Diet No. 103 when meat was added isocalorically (Diet No. 104), and at the expense of the entire ration (Diet No. 105). Groups were also included to determine if the performance could be improved by the addition of a mineral mixture and vitamins. Consequently Diet No. 101, which contained meat, was supplemented with 2 per cent minerals (13) and vitamins (Diet No. 106), and Diet No. 103 which did not contain meat was similarly supplemented (Diet No. 107). The following vitamins (in mg.) were added per kilogram of diet: thiamine, 5; pyridoxine, 5; niacin, 5; riboflavin, 10; calcium pantothenate, 100; choline, 1000; inositol, 500; pteroylglutamic acid, 2; and biotin, 0.1. A fat-soluble vitamin mixture was prepared as follows: 60 gm. fortified cod-liver oil (400 I.U. Vitamin D and 3000 I.U. vitamin A per gram), 12 gm. 30 per cent mixed

[1] Received for publication September 10, 1948. This work was supported in part by a grant-in-aid from the National Live Stock and Meat Board.

Some of the data were taken from a thesis submitted by Plinio B. Junqueira in partial fulfillment of the requirements for a degree of Master of Science in biochemistry and nutrition.

The valuable assistance of Helen Keene and Juanita Pou is gratefully acknowledged.

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tocopherols, and 40 mg. 2-methyl-1,4 napthoquinone were mixed together; then 3.6 gm. of this mixture were added per kilogram of ration.

All diets used in this study were prepared at frequent intervals and stored in a refrigerator. The diets and water were supplied to the animals *ad libitum*.

From the proximate analyses of the wheat and meat used, the amount of meat to be added to Diets No. 101 and 104 was determined. The protein content of different lots of wheat (selected seed wheat) ranged from 12.2 to 13.7 per cent.

The growth performance for each group for the first six weeks on the experimental regimen and the average weight at breeding time (twelve weeks of age) are shown in Table 1. It can be seen that the addition of meat to the wheat-milk rations increased the rate of gain and also the weight at breeding time as compared to when the respective wheat-milk basal rations (Diets No. 100 and 103) were fed. The addition of minerals and vitamins did not improve the performance.

The reproduction and lactation performance for three successive litters is summarized in Table 2. The size of the litters and the weight of the young at weaning were increased when meat supplements were added either isocalorically or at the expense of the entire ration. The percentage of young weaned was also increased for the groups receiving 16.7 per cent whole milk powder (Diet No. 100 as compared to Diets No. 101 and 102). The females fed Diet No. 100 showed considerable alopecia over the shoulders and flanks, and alopecia also occurred on some of the young. No alopecia was observed in the other groups. No consistent differences between groups were observed in the weight of the young at birth, weight loss of the females during lactation, time interval between litters, and number of young born dead.

The low weaning percentage for the group fed Diet No. 104 can be explained at least in part by a high incidence of respiratory infection during the latter half of the second period of lactation and during the third lactation. A few females in other groups also developed respiratory infections. The performance of the groups receiving mineral and vitamin supplements (Diets No. 106 and 107) was not improved over that of the control groups (Diets No. 101 and 103).

The comparative rates of gain of the young as reflected by their weights at weaning were consistent with the results observed at seven days or at fourteen days. Further, the results were uniform for each of the three periods of lactation. As shown in Table 3, the improvement attributable to the addition of meat (Diet No. 100 as compared to Diets No. 101 and 102; Diet No. 103 as compared to Diets No. 104 and 105) is readily apparent. A statistical analysis of the data showed that the increase in the weight at weaning observed when meat was fed in addition to the ration containing 33.3 per cent whole milk powder (Diets No. 104 and 105 as compared to Diet No. 103) was highly significant.

These experiments confirmed other work (12) which showed that increasing the amount of milk from 16.7 to 33.3 per cent improved the growth, reproduction, and lactation performance. The performance noted when meat was added to these diets demonstrated that both of the wheat-milk diets could be further improved.

TABLE 1

*Composition of diets and growth performance of the females*

| DIET NO. | AVERAGE COMPOSITION | | | | AVERAGE PROTEIN CONTENT | RATE OF GAIN OF FEMALES (6 WEEKS) | WEIGHT AT BREEDING (9 WEEKS) |
|---|---|---|---|---|---|---|---|
| | Whole wheat | Whole milk powder | Meat | Sodium chloride | | | |
| | % | % | % | % | % | gm. | gm. |
| 100 | 82.5 | 16.7 | | 0.8 | 15.4 | 15.2 | 180 |
| 101* | 65.8 | 16.7 | 11.4 | 0.7 | 22.7 | 22.5 | 207 |
| 102† | 82.5 | 16.7 | 11.4 | 0.8 | 21.4 | 23.0 | 210 |
| 103‡ | 66.0 | 33.3 | | 0.7 | 17.7 | 20.2 | 203 |
| 104* | 49.3 | 33.3 | 11.4 | 0.5 | 25.2 | 24.4 | 220 |
| 105† | 66.0 | 33.3 | 11.4 | 0.7 | 23.4 | 24.9 | 222 |
| 106‡ | 63.9 | 16.7 | 11.4 | 0.6 | 22.0 | 24.6 | 222 |
| 107‡ | 64.0 | 33.3 | | 0.7 | 17.4 | 22.2 | 206 |

* 16.7 parts of the wheat in Diets No. 101 and 104 were replaced isocalorically by meat.

† The meat was added to Diets No. 102 and 105 at the expense of the entire ration.

‡ Two parts of a mineral mixture (13) were added at the expense of the wheat, and vitamins were also added (see text).

TABLE 2

*Summary of reproduction and lactation performance for three successive litters*

| DIET NO. | LITTERS BORNE | AVERAGE YOUNG BORN PER FEMALE | YOUNG WEANED* | AVERAGE WEIGHT OF YOUNG AT WEANING | COMMENTS |
|---|---|---|---|---|---|
| | | | % | gm. | |
| 100 | 24 | 8.1 | 62 | 26.3 | Alopecia occurred on some of the young |
| 101 | 20 | 11.8 | 84 | 42.2 | One female failed to breed |
| 102 | 21 | 10.2 | 80 | 41.1 | One female failed to breed |
| 103 | 22 | 8.1 | 80 | 39.6 | |
| 104 | 22 | 10.9 | 61 | 43.4 | High occurrence of respiratory infection |
| 105 | 16 | 10.5 | 90 | 44.2 | Group accidently reduced to 6 females |
| 106 | 24 | 11.0 | 85 | 44.2 | |
| 107 | 19 | 8.4 | 81 | 37.8 | |

* Based on the number of young kept.

It appeared likely that the improved performance when meat was added was due to the addition of protein. The superior quality of meat protein or unknown factors contributed by the meat may also have resulted in an improvement in the nutritive value of the diets. The rations containing meat were not further improved by the addition of vitamins and minerals nor was the basal ration containing 33.3 per cent milk powder improved, indicating that these rations were adequate in these supplements.

TABLE 3

*Weights of young at weaning for each of the periods of lactation*

| DIET NO. | LACTATION PERIOD | YOUNG WEANED | AVERAGE WEIGHT AT WEANING |
|---|---|---|---|
| | | | *gm.* |
| 100 | 1 | 38 | 23.8 |
| | 2 | 10 | 24.5 |
| | 3 | 35 | 29.5 |
| 101 | 1 | 35 | 43.1 |
| | 2 | 39 | 43.2 |
| | 3 | 26 | 39.5 |
| 102 | 1 | 40 | 45.5 |
| | 2 | 27 | 37.4 |
| | 3 | 32 | 38.5 |
| 103 | 1 | 34 | 41.0 |
| | 2 | 35 | 38.5 |
| | 3 | 17 | 39.2 |
| 104 | 1 | 38 | 43.6 |
| | 2 | 24 | 43.8 |
| | 3 | 18 | 42.1 |
| 105 | 1 | 34 | 47.2 |
| | 2 | 31 | 41.3 |
| | 3 | 16 | 44.3 |
| 106 | 1 | 47 | 45.8 |
| | 2 | 39 | 44.7 |
| | 3 | 26 | 40.7 |
| 107 | 1 | 31 | 37.6 |
| | 2 | 25 | 34.7 |
| | 3 | 21 | 41.3 |

*Experiment 2*

A second experiment was devised to extend these observations and to obtain more information on the nature of the nutrients in meat that were effective in improving the performance. In this study the same experimental techniques were used. Vitamins were added to all diets at the levels previously indicated to assure an adequate intake for all groups, since an inspection of the amount of vitamins in basal Diet No. 100 revealed that it may be somewhat low in riboflavin. In addition to the basal diet, other groups were fed meat as defatted and dehydrated beef round[4] to increase the protein level by 5 per cent. Similar substitutions of casein, the addition of liver extract, or combinations of these supplements were also made.

The composition of the diets and their average protein contents are listed in Table 4. It will be noted that a smaller amount of meat was fed for some of the groups than in the first experiment and that the substitutions were made to increase the protein content by increments of 5 per cent in the ration by replacement rather than by caloric equivalents. Purified casein (Labco) was used and in three of the diets 1:20 liver extract[5] was added at a level of 4 per cent as a source of unknown factors. The crude protein figures listed do not include the amounts contributed by the liver extract.

The growth, reproduction, and lactation perform-

[4] The canned beef round and the defatted and dehydrated beef round were supplied by Wilson and Co., Chicago.

[5] Supplied by Dr. C. E. Graham, Wilson Laboratories, Chicago.

TABLE 4

*Summary of growth, reproduction, and lactation performance of groups of rats fed meat, casein, and liver extract for three successive litters*

| DIET NO. | COMPOSITION | | | | | PROTEIN CONTENT | RATE OF GAIN OF FEMALES (6 weeks) | YOUNG BORN PER FEMALE | YOUNG WEANED* | AVERAGE WEIGHT OF YOUNG AT WEANING |
|---|---|---|---|---|---|---|---|---|---|---|
| | Wheat | Whole milk powder | Meat | Casein | Liver extract | | | | | |
| | % | % | % | % | % | % | *gm.* | | % | *gm.* |
| 100A | 82.5 | 16.7 | | | | 15.8 | 20.9 | 11.5 | 67 | 36.6 |
| 100A | 75.6 | 16.7 | 7.0 | | | 20.9 | 23.4 | 12.0 | 68 | 42.1 |
| 108 | 76.6 | 16.7 | | 5.7 | | 20.7 | 23.0 | 10.8 | 86 | 42.9 |
| 109 | 72.3 | 16.7 | | 6.3 | 4.0 | 20.7 | 21.6 | 11.5 | 72 | 43.0 |
| 110 | 69.9 | 16.7 | 7.0 | 5.7 | | 25.8 | 23.9 | 11.6 | 82 | 45.3 |
| 111 | 65.4 | 16.7 | 7.0 | 6.3 | 4.0 | 25.8 | 24.3 | 11.2 | 83 | 42.4 |
| 112 | 68.6 | 16.7 | 14.0 | | | 26.0 | 24.6 | 11.8 | 84 | 43.3 |
| 113 | 64.2 | 16.7 | 14.5 | | 4.0 | 25.9 | 21.9 | 11.1 | 85 | 41.2 |

* Based on the number of young kept.

ances are briefly summarized in Table 4. The rate of growth of the the females fed the basal ration supplemented with vitamins was improved somewhat by the addition of meat or casein, but was not further improved by the addition of liver extract. The number of young born, number born alive, weight loss of the females, and interval between litters was essentially the same for all groups.

The weight of the young at weaning was improved by the addition of 5 per cent protein as casein or as meat, but was not further improved by the addition of liver extract. In fact, when liver extract was added to the diets containing meat, the results were slightly inferior. The weights at weaning of the young from females fed Diet No. 103A were consistently below those for all groups fed 5 per cent or more protein for each of the three periods of lactation.

The percentage of young weaned was improved for most of the groups when the level of protein was increased to 20 or 25 per cent. Exceptions were noted when Diet No. 101A, which contained meat, and when Diet No. 109, which contained casein and liver extract, were fed. As in the first experiment, alopecia occurred on several of the young from the group fed Diet No 100A.

The improved performance of the group fed the basal diet in this experiment may be due largely to the inclusion of vitamins in the basal ration. The wheat used in this study was slightly higher in protein, but it is doubtful if the additional 0.4 per cent protein was a major factor. The performance, however, was still not optimal, and the results clearly indicated that factors in addition to vitamins were inadequate in the original basal ration (Diet No. 100, Table 1). One of these factors was the level and/or quality of protein as demonstrated by the superior results obtained when additional protein as casein or as meat was supplied. That other nutrients in casein or meat may have been beneficial cannot be excluded. It may also be concluded that 1:20 liver extract did not contribute factors needed in addition to those supplied by the casein- or meat-supplemented diets. Recent reports (14, 15) also indicate that the basal wheat-milk rations may be improved by supplementation with poultry meat and riboflavin.

## SUMMARY

The addition of meat (canned beef round) to diets containing wheat and milk markedly improved the growth, reproduction, and lactation performance of rats. The number of young born per female was increased from eight to eleven when meat was added, and the average weight of the young at weaning rose from 26 to 42 gm. when meat was added to the basal diet containing 16.7 per cent milk powder and from 39 to 43 gm. when meat was added to the basal diet containing 33.3 per cent milk powder.

Other experiments demonstrated that the additional protein contributed by the meat was the major factor accounting for the improved performance. Liver extract did not contribute unknown factors needed in addition to the meat- or casein-supplemented rations.

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According to *The Trained Nurse*, sixteenth century Frenchmen ate raw snails if they had lung trouble, seriously believing that this would make them well.

# Thiamine and Riboflavin Retention in Pork Sausage[1]

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DATA concerning the thiamine and riboflavin content of pork sausage and retention during cooking are very meager. Pyke (1) has reported 0.048 mg. per 100 gm. of thiamine for raw sausage, while McIntire *et al.* (2) found 0.40 mg. per 100 gm. When the meat from which the sausage was prepared came from animals fed grain rations containing 0.11 and 0.21 mg. thiamine per kilogram body weight, Heinemann *et al.* (3) found a thiamine content in the sausage of 0.455 and 0.567 mg. per 100 gm. respectively. McIntire and co-workers (2) reported also a riboflavin content of 0.15 mg. per 100 gm. raw sausage, a thiamine and riboflavin content respectively of 0.50 and 0.22 mg. per 100 gm. of broiled sausage, and a thiamine and riboflavin retention of 75 and 83 per cent in the broiled meat—87 and 90 per cent in the meat drippings together.

The present study extends these data. In it, the thiamine and riboflavin contents of seven lots of pork sausage have been determined before and after pan broiling with and without water, and the percentages of thiamine and riboflavin retained have been calculated.

## EXPERIMENTAL PROCEDURE

The sausage was purchased in the link form on the retail market in 6-lb. lots. The first three lots were obtained during a period of meat shortage, and nothing is known concerning the cuts of meat from which they were prepared. The last four lots, however, were prepared from well selected pork trimmings obtained largely from shoulder cuts.

Each 6-lb. lot was divided into three similar portions by assigning successively to three groups such links as were attached to each other and distributing the others at random among the three groups. One of these portions was reground, thoroughly mixed, and analyzed as the raw sample. Another was placed in a cold frying pan, 30 cc. of water added, the sausage cooked over low heat until the water had evaporated (about 15 min.), then browned over moderate heat. The third portion was placed in a cold frying pan and cooked very slowly until brown (about 30 min.). With the first three lots, an addition of 13 to 26 gm. of lard was necessary at the beginning of the browning period in order to prevent

TABLE 1

*Thiamine and riboflavin content of pork sausage, raw and pan broiled, with and without water*

| LOT NUMBER | THIAMINE* | RIBOFLAVIN* |
|---|---|---|
| | Raw | |
| | *mg./100 gm.* | *mg./100 gm.* |
| 1 | 0.322 | 0.250 |
| 2 | 0.163 | 0.156 |
| 3 | 0.167 | 0.215 |
| 4 | 0.452 | 0.238 |
| 5 | 0.394 | 0.149 |
| 6 | 0.440 | 0.170 |
| 7 | 0.466 | 0.133 |
| | Pan Broiled with Water | |
| 1 | 0.363 | 0.243 |
| 2 | 0.182 | 0.170 |
| 3 | 0.198 | 0.230 |
| 4 | 0.985 | 0.416 |
| 5 | 0.578 | 0.358 |
| 6 | 0.622 | 0.392 |
| 7 | 0.632 | 0.241 |
| | Pan Broiled without Water | |
| 1 | 0.362 | 0.365 |
| 2 | 0.175 | 0.191 |
| 3 | 0.198 | 0.257 |
| 4 | 1.049 | 0.409 |
| 5 | 0.548 | 0.346 |
| 6 | 0.713 | 0.313 |
| 7 | 0.623 | 0.336 |

* In moist meat.

[1] Scientific Journal Series Paper No. 2353, Minnesota Agricultural Experiment Station. Work was done as part of the National Cooperative Project, Conservation of the Nutritive Value of Foods. Received for publication March 3, 1948.

scorching, while, with the last four, excess fat collected and was poured off from time to time. Each cooked portion was ground, well mixed, and aliquots taken for the various analyses.

Thiamine was determined by the Conner and Straub method (4) except that adsorption was omitted, since preliminary determinations showed no significant difference in the results obtained with and without adsorption. Riboflavin was determined by the Peterson, Brady, and Shaw method (5). In each case, internal standards formed the basis of calculation, and recovery samples, to which a known amount of thiamine or riboflavin was added before extraction, were analyzed with each determination. The average recovery of thiamine was 97 per cent, with a range of 93 to 102 per cent; the average recovery of riboflavin was 98 per cent, with a range of 92 to 100 per cent.

Fat was determined by the method of Oesting and Kaufman (6) and moisture (in the last lot) by the difference in weight of several 10-gm. portions before and after drying for 36 hr. at 60°C. and 25 in. of vacuum. The total loss in weight and the loss as drippings were calculated from weighings made before and after cooking.

## RESULTS

The thiamine and riboflavin contents of the various lots of sausage are given in Tables 1 and 2—in the former, in terms of milligrams per 100 gm. edible portion, and in the latter in terms of milligrams per total quantity cooked. As may be seen from Table 1, the thiamine content of the raw samples ranged from 0.163 mg. per 100 gm. of meat in Lot *2* to 0.466 mg. in Lot *7*, with a majority of the samples close to the maximum. The riboflavin content ranged from 0.133 mg. per 100 gm. in Lot *7* to 0.250 in Lot *1*, with three of the samples close to the maximum. The greatest concentrations of thiamine and riboflavin, it will be observed, were present in different lots of sausage. The highest thiamine and the lowest riboflavin values are similar to those reported by Heinemann *et al.* (3) and McIntire *et al.* (2).

The percentage retentions of thiamine and riboflavin in the cooked samples are also given in Table 2. As may be noted, the method of cooking made no significant difference in the average retention of either thiamine or riboflavin, the average retention of thiamine for both methods being 86 per cent of the amount present in the raw samples and the average riboflavin being 95 per cent retention for one method and 105 per cent for the other—values which are not significantly different when the quantities present in the individual samples vary as much as these do.

There is no apparent reason why the first four

TABLE 2

*Thiamine and riboflavin content and retention in pork sausage, raw and pan broiled, with and without water*

| LOT NUMBER | WEIGHT OF MEAT | | WEIGHT LOSS | | THIAMINE* | | | | RIBOFLAVIN* | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | In meat | | | | In meat | | | |
| | Before cooking | After cooking | In drippings | Total | Before cooking | After cooking | In drippings | Retention in meat | Before cooking | After cooking | In drippings | Retention in meat |
| **Pan Broiled with Water** | | | | | | | | | | | | |
| | *gm.* | *gm.* | *%* | *%* | *mg./lot* | *mg./lot* | *mg./lot* | *%* | *mg./lot* | *mg./lot* | *mg./lot* | *%* |
| 1 | 868 | 728 | 0 | 16 | 2.79 | 2.64 | | 95 | 2.17 | 1.77 | | 82 |
| 2 | 888 | 751 | 0 | 13 | 1.45 | 1.37 | | 95 | 1.39 | 1.28 | | 92 |
| 3 | 905 | 774 | 0 | 15 | 1.51 | 1.53 | | 101 | 1.95 | 1.78 | | 91 |
| 4 | 947 | 424 | 38 | 55 | 4.28 | 4.18 | 0.06 | 98 | 2.25 | 1.76 | 0.05 | 78 |
| 5 | 738 | 368 | 27 | 50 | 2.91 | 2.13 | | 73 | 1.10 | 1.32 | 0.02 | 120 |
| 6 | 975 | 472 | 28 | 52 | 4.29 | 2.94 | 0.02 | 69 | 1.66 | 1.85 | 0.03 | 111 |
| 7 | 939 | 477 | 27 | 49 | 4.38 | 3.01 | 0.04 | 69 | 1.25 | 1.15 | 0.06 | 92 |
| Mean..... | | | | | | | | 86 | | | | 95 |
| **Pan Broiled without Water** | | | | | | | | | | | | |
| 1 | 906 | 747 | 0 | 17 | 2.92 | 2.70 | | 93 | 2.27 | 2.73 | | 120 |
| 2 | 902 | 760 | 0 | 15 | 1.47 | 1.33 | | 91 | 1.41 | 1.45 | | 103 |
| 3 | 899 | 785 | 0 | 13 | 1.50 | 1.55 | | 103 | 1.93 | 2.02 | | 105 |
| 4 | 955 | 434 | 38 | 55 | 4.50 | 4.55 | 0.06 | 101 | 2.27 | 1.77 | 0.05 | 78 |
| 5 | 750 | 362 | 28 | 52 | 2.96 | 1.98 | | 67 | 1.12 | 1.25 | 0.01 | 112 |
| 6 | 963 | 464 | 28 | 52 | 4.24 | 3.31 | 0.02 | 78 | 1.64 | 1.45 | 0.03 | 88 |
| 7 | 938 | 472 | 28 | 49 | 4.37 | 2.94 | 0.04 | 67 | 1.25 | 1.59 | 0.05 | 127 |
| Mean..... | | | | | | | | 86 | | | | 105 |

* Reported in terms of the quantity present in the total sample cooked.

TABLE 3

*Fat content of raw and cooked samples of pork sausage*

| LOT NUMBER | FAT |
|---|---|
| | Raw |
| | % |
| 1 | 5.7 |
| 2 | 16.2 |
| 3 | 13.0 |
| 4 | 55.5 |
| 5 | 46.8 |
| 6 | 43.6 |
| 7 | 46.4 |
| | Pan Broiled with Water |
| 1 | 6.3 |
| 2 | 13.8 |
| 3 | 12.0 |
| 4 | 27.4 |
| 5 | 35.4 |
| 6 | 46.2 |
| 7 | 37.4 |
| | Pan Broiled without Water |
| 1 | 6.8 |
| 2 | 12.8 |
| 3 | 11.4 |
| 4 | 29.0 |
| 5 | 39.9 |
| 6 | 35.9 |
| 7 | 38.1 |

lots of sausage retained a greater proportion of the thiamine present in the raw samples than did the last three. The high retentions were not associated with the fat content (Table 3), nor seemingly with the cuts of pork used in preparing the sausage, for the fourth lot closely resembled the last two in these respects, yet the retentions were similar to those in the first three lots. Nor is it likely that the difference was due to the basis upon which the calculations were made, for when the retention in the last lot (for which moisture determinations were available) was recalculated on the dry, fat-free basis, the resulting figure agreed with the value given in Table 2. Likewise, agreement between the two methods of calculation has been obtained for a number of other types of meat, as for example bacon (7).

The cause of the occasional high values in the percentage retentions of riboflavin is also not known, but similarly high figures have been reported for beef (8).

The drippings contained such small quantities of thiamine and riboflavin (Table 2) that the thiamine content never exceeded 1 per cent or the riboflavin 5 per cent of the amount originally present in the sample.

The total loss in weight during cooking and the loss as drippings are given in Table 2. It is apparent that there was no difference in either of these losses between the samples cooked with water and those cooked without. The total loss in weight from the first three lots, which were very low in fat content, was relatively small, averaging only about 15 per cent of the raw weight. This loss was due to a loss of moisture since the weight of the "drippings" was approximately that of the lard added at the beginning of browning. The total loss in weight for the last four lots averaged a little over 50 per cent, and the loss in drippings ran about 30 per cent. The moisture loss from these lots was, therefore, around 20 per cent, which was very close to the average moisture loss sustained by the first three lots.

SUMMARY

The thiamine and riboflavin content of seven lots of pork link sausage purchased on the retail market over a nine-month period have been determined by fluorometric methods before and after pan broiling, with and without the addition of a small quantity of water.

Four of the lots of sausage contained practically 0.4 or more mg. of thiamine per 100 gm. of raw meat, but one contained about three-fourths and two less than half this amount. Three of the lots contained over 0.2 mg. of riboflavin per 100 gm. of raw meat, while the others contained about two-thirds of this amount.

The method of cooking made no significant difference in the average retention of either thiamine or riboflavin, the average retentions of thiamine and riboflavin being respectively 86 and 100 per cent of the amounts present in the raw samples.

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*The Trained Nurse* reports that in 80 A.D., the popular cure for indigestion was a dose of finely ground, cooled lava from Mt. Vesuvius. It was mixed with either food or wine.

# Editorial

## NUTRITION FOUNDATION, MAKES GRANT TO A.D.A. FOR MARY SWARTZ ROSE FELLOWSHIP

To symbolize the ideals of dietitians, the Nutrition Foundation, Inc., has made a grant to the American Dietetic Association to be used to establish and maintain an annual fellowship of $1000. As announced in October at the 31st Annual Meeting of the Association in Boston, it will be known as the Mary Swartz Rose Fellowship and will be awarded for graduate study and research in nutrition or allied fields.

The Fellowship was named for Mary Swartz Rose at the suggestion of the Nutrition Foundation which felt that the award would gain inspirational value if named in honor of an acknowledged pioneer in the field whose accomplishments would personalize the spirit of the award. Mary Swartz Rose, one of the true pioneers in the field of education in nutrition and in dietetics, was the first to hold a professorship in nutrition at an American university. In 1921, she was appointed Professor of Nutrition at Teachers College, Columbia University. So brilliant was her light of leadership that the honors bestowed upon her in her lifetime were too many to enumerate here. Her activities were both national and international in scope, for she served on the Council on Foods and Nutrition of the American Medical Association and as a member of the Nutrition Committee of the Health Organization of the League of Nations. As an author, her books are still used as basic texts in nutrition courses. Almost every dietitian is familiar with: *The Foundations of Nutrition*, *Feeding the Family*, *Teaching Nutrition to Boys and Girls*, *Laboratory Handbook of Dietetics*, and *Food Values of Recipes in Shares and Vitamin Units*. In 1940, she was given the unique recognition by the American Dietetic Association of an honorary membership, and at the Association's convention in New York that year was presented with a scroll. It, therefore, seemed exceedingly fitting and appropriate that this fellowship offered to the American Dietetic Association by the Nutrition Foundation in recognition of the work of dietitians in promoting better nutrition should be named after such an outstanding pioneer and leader in our field.

The provisions of the Mary Swartz Rose Fellowship follow:

Applicants for the Fellowship must (a) be members of the American Dietetic Association, (b) have ranked in the upper quartile of their respective graduating classes, and (c) have majored as undergraduates in a field closely related to that in which the Fellowship is sought or have gained equivalent training later, and (d) show promise of making a valuable contribution to the profession.

A Nutrition Foundation Fellowship Committee within the American Dietetic Assocation shall be appointed by the Association's President, subject to the approval of the Executive Board of the Association. The Committee shall consist of six members. Of the initial Committee members two shall be appointed for a term of one year, two for two years, and three for three years. The membership of this Committee will represent primarily the fields of interest in which the Fellowship might conceivably be granted. The President of the Association shall be an ex-officio member and, in case of a tie, may cast the deciding vote.

The Fellowship Committee may secure or receive nominations from any source within the Association. The details of the method of securing nominations, the selection of a suitable candidate, the allotment and payment of funds which may be necessary for the contemplated study shall be made and the announcement of the award shall be matters within the jurisdiction of the Committee.

Nominations for the award and all supporting recommendations shall be in the hands of the Committee not later than February 1, 1949, and the award made and the candidate notified of the selection not later than March 15. Unsuccessful candidates shall be notified at the same time.

Nominations of candidates shall be accompanied by adequate evidence of their training and ability to pursue their plans in a satisfactory manner.

It is expected that applicants interested in newer aspects of nutrition or allied fields shall receive consideration. For example, a grant might be made to a well-trained nutritionist, probably a person having had some experience in the field of teaching at the college level, to complete a medical course in order to be prepared for teaching nutrition to medical and dental students. It is suggested that this Fellowship be applied in various fields of nutrition research or its application.

# Current Comment

## THE MASTER MIX IN QUANTITY

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Some time ago the development in the experimental cookery and institution management laboratories of Purdue University of a "master mix" to be made and used in the home was announced[2] (1, 2). From it, a number of baked products could be made with a saving of time of up to 75 per cent. Work on this project was continued at Purdue this year, and proportions for the master mix which are suitable for large-scale cooking have now been worked out. These proportions are given on the following page.

Large quantities of the mix can be prepared at one time and stored in covered containers, for it will keep without refrigeration for several weeks. Any large can with cover can be used as a container for storing the mix, or it can be stored in smaller containers in weighed or measured amounts, ready for use without further measuring. This "before-hand" feature of the mix makes it possible to spread work in the institution kitchen, making the best use of "slack" moments in preparing for future "rush" periods and emergencies.

If available equipment is large enough, a mix using 25 lb. of flour can readily be made. When prepared, the mix is one and one-half times the weight of the flour used. For example, 25 lb. flour would yield 37½ lb. mix. This amount of mix, in turn, could yield about 700 biscuits, 600 muffins, 500 servings of coffee cake, 700 servings of cake, 150 dozen cookies, or smaller yields of any combination of these products.

The recipes in this article have been scaled to serve between 125 and 150 people. The mixing directions are simple and definite enough that they may be easily followed. Directions for each recipe may be pasted on a card and filed, or slipped into a cellophane envelope.

### TIME STUDIES

The weighing of all ingredients and the sifting of dry ingredients need not take longer than 25 min., and the actual time needed for blending the fat with the dry ingredients is less than 2 min. on a power machine.

Time comparisons were made when the master mix and usual methods were used for making biscuits and cakes.[3] It took an average of 28½ min. for making two, 22½-lb. batches of master mix. This included the time used in assembling the ingredients, weighing them, sifting the dry ingredients three times, blending the fat, and storing the mix.

The time used in weighing ingredients and making biscuit dough from 5 lb. of flour was 17 min. When the biscuit dough was made from the mix, the time was 4 min. Ten min. were added to the latter figure to represent the time for making the portion of the mix used in this dough (7½ lb. of the 22½ lb. of mix). The time for making biscuit dough from the mix plus the time used in making that portion of the mix was 14 min. compared with 17 min. when biscuit dough was made in the usual manner. This was a saving of 3 min.

With cake batter made by the conventional method, the time used in weighing ingredients and mixing the batter from about 4 lb. flour was 42 min. This included all the steps until the batter was ready for the pans. When made with the mix, the time for making the cake batter was 19 min. Seven min. were added to the latter figure to represent the time used in making the portion of the mix used in this batter (5⅓ lb. of the 22½ lb. of mix). Thus the total time for making cake batter was 26 min., compared with 42 min. when cake batter was made by the conventional method—a saving of 16 min. or 38 per cent.

Thus, not only is there a saving of time *per se* in the use of the mix, but there is also the advantage that the mix could be prepared in slack periods, thus helping in advance to alleviate peak periods of work in the busy kitchen. By preparing the mix in advance,

[1] Mildred Stevason and other students assisted in developing the large quantity recipes presented in this paper.

[2] Most of the work in the development of the original formula for the master mix and the "family size" recipes was done in a Special Problems course by Margaret Billings and Lucy Goetz.

[3] This work was done by Margaret Nordlinger.

employees' time can better be used during non-rush periods, and the "humps" of rush times can be flattened out somewhat.

### COSTS

Calculating costs from November, 1948 prices in Lafayette, Indiana, the master mix would cost 13 cents a pound when made from soft wheat flour and 14 cents a pound when made from cake flour. In comparing costs for biscuits made from the master mix and from commercial biscuit mixes, the master mix would be cheaper if the commercial mix were more than 13 cents a pound. This figure for the master mix does not include labor costs.

In comparing costs of cakes made from the master mix and from commercial cake mixes, the cakes from the master mix would be cheaper if the commercial mix were more than 23 cents a pound. This figure, too, does not include labor costs for the master mix.

### ALTERNATIVE QUANTITIES AND INGREDIENTS

If the master mix is to be used mainly for cakes and cookies, better quality will be obtained if cake flour is used. The cake flour should be substituted in equal quantities by weight, but not by measure. If measurements instead of weights are used in making the mix with cake flour, one should multiply the flour measurements given in the box by one and one-fifth. Four cups of all-purpose flour make a pound, but there are about 4¾ cups of cake flour in a pound.

If the master mix is to be used for cakes, a shortening containing an emulsifier should be used. It is unnecessary to use shortening with an emulsifier unless the mix is intended for cakes.

There are two reasons for using cream of tartar in the master mix, one concerned with nutritive value and the other with quality. Several studies have shown that there is less destruction of thiamine during baking if the reaction is slightly acid. Since cream of tartar is acid, its use in the mix should reduce the destruction of thiamine during baking. It has also been found[4] that slightly better quality resulted when small amounts of cream of tartar were used in biscuits, muffins, and cakes. The main difference was in the tenderness.

It should be possible to use nonfat dry milk solids and water with the mix instead of milk in the recipes. One and one-half oz. of the dry milk powder added to the dry ingredients in the mix for each pound of flour would give about the same proportion as the milk solids in the milk in most of the recipes. This would be about one-tenth as much powder as flour in the mix, either by weight or by measure. Since the milk solids would make up a part of the weight of the mix, the amount of mix called for in the recipes would need to be increased. This increase would be 1 lb. for every 15 lb. of mix called for in the recipe.

[4] By Mary Emerson, a student in a Special Problems course.

*Ingredients and amounts used for making six different quantities of the master mix*

| INGREDIENTS | QUANTITY | |
|---|---|---|
| | Weight | Measure |
| **7½ lb. master mix** | | |
| Flour | 5 lb. | 5 qt. |
| Baking powder | 4 oz. | ¾ cup |
| Salt | 1½ oz. | 2½ Tbsp |
| Cream of tartar | ½ oz. | 2 Tbsp. |
| Sugar | 2 oz. | ¼ cup |
| Shortening* | 2 lb. | 4½ cups |
| **10 lb. master mix** | | |
| Flour | 6 lb. 10 oz. | 6½ qt. |
| Baking powder | 5 oz. | 1 cup |
| Salt | 2 oz. | ⅓ cup |
| Cream of tartar | ½ oz. | 2 Tbsp. |
| Sugar | 3 oz. | ⅓ cup |
| Shortening* | 2 lb. 10 oz. | 6 cups |
| **15 lb. master mix** | | |
| Flour | 10 lb. | 10 qt. |
| Baking powder | 8 oz. | 1½ cups |
| Salt | 3 oz. | 5 Tbsp. |
| Cream of tartar | 1 oz. | ¼ cup |
| Sugar | 4 oz. | ½ cup |
| Shortening* | 4 lb. | 9 cups |
| **22½ lb. master mix** | | |
| Flour | 15 lb. | 15 qt. |
| Baking powder | 12 oz. | 2¼ cups |
| Salt | 4 oz. | ½ cup |
| Cream of tartar | 1½ oz. | ⅓ cup |
| Sugar | 6 oz. | ¾ cup |
| Shortening* | 6 lb. | 13½ cups |
| **30 lb. master mix** | | |
| Flour | 20 lb. | 20 qt. |
| Baking powder | 1 lb. | 3 cups |
| Salt | 6 oz. | ⅔ cup |
| Cream of tartar | 2 oz. | ½ cup |
| Sugar | 8 oz. | 1 cup |
| Shortening | 8 lb. | 4½ qt. |
| **37½ lb. master mix** | | |
| Flour | 25 lb. | 25 qt. |
| Baking powder | 1 lb. 4 oz. | 3¾ cups |
| Salt | 8 oz. | ¾ cup |
| Cream of tartar | 2½ oz. | ⅔ cup |
| Sugar | 10 oz. | 1¼ cups |
| Shortening* | 10 lb. | 5½ qt. |

* Shortening which does not require refrigeration.

*Directions for mixing:*

Stir the flour, baking powder, salt, cream of tartar, and sugar until blended. Sift three times. Turn into the mixing bowl of a large mixer. Cut the fat into six or eight portions and put on top of dry ingredients.

Use the flat paddle to blend the ingredients. Start mixer on "low" speed. Mix 45 seconds. Scrape. Mix 45 additional seconds. The mix should now be well blended and somewhat like cornmeal in consistency.

*The master mix being prepared in the power mixer in the laboratories at Purdue University.*

## RECIPES USING THE MASTER MIX

### Muffins

Yield: 235 muffins

| *Ingredients* | *Weight* | *Measure* |
|---|---|---|
| Mix | 15 lb. | 15 qt. |
| Sugar | 1 lb. 8 oz. | 3½ cups |
| Milk | 10 lb. | 4¾ qt. |
| Eggs | 2 lb. | 19 |

*Directions:*

Stir sugar into the mix. Combine milk and beaten eggs. Add to the mix. Stir until dry ingredients are just dampened (about 30 seconds on "low" speed in mixer). Bake in greased muffin pans in a hot oven (425°) 20 to 25 min.

### Drop Cookies

Yield: 12 doz.

| *Ingredients* | *Weight* | *Measure* |
|---|---|---|
| Mix | 3 lb. | 3 qt. |
| Sugar | 1 lb. 12 oz. | 4 cups |
| Milk | 12 oz. | 1½ cups |
| Eggs | 7 oz. | 4 |
| Vanilla | ½ oz. | 1 tbsp. |
| *Variations* | | |
| Chocolate chunks | 6 oz. | 2 cups |
| | *Or* | |
| Chopped nuts | ½ lb. | 2 cups |
| | *Or* | |
| Chopped raisins | 1 lb. | 2 cups |
| | *Or* | |
| Cut dates | 1 lb. | 2 cups |
| | *Or* | |
| Grated orange rind | 1 oz. | ¼ cup |
| Chopped raisins (Omit vanilla) | 1 lb. | 2 cups |

*Directions:*

Stir sugar into the mix. Combine milk, beaten eggs, and vanilla, and add to the mix. Add remaining ingredients. Stir in mixer set at "low" for 1 min. Drop from teaspoon onto greased cookie sheets. Bake in a moderate oven (375°) about 10 min. Remove from sheet at once.

### Oatmeal Cookies

Yield: 14 doz.

| *Ingredients* | *Weight* | *Measure* |
|---|---|---|
| Mix | 3 lb. | 3 qt. |
| Brown sugar | 1 lb. 12 oz. | 4 cups |
| Cinnamon | ⅛ oz. | 1 Tbsp. |
| Milk | 1 lb. | 2 cups |
| Eggs | 7 oz. | 4 |
| Quick oats | 11 oz. | 1 qt. |
| Raisins | 5 oz. | 1 cup |
| Nuts | 4 oz. | 1 cup |

*Directions:*

Stir sugar and cinnamon into the mix. Combine milk and beaten eggs and stir into the mix until well blended. Stir in remaining ingredients. Drop from teaspoon onto greased cookie sheets and flatten. Bake in a moderate oven (375°) about 10 min. Remove from sheet at once.

### Yellow Cake

Yield: 6 pans, 10 by 14 by 2½ in. Servings: 24 pieces/pan

| *Ingredients* | *Weight* | *Measure* |
|---|---|---|
| Mix | 8 lb. | 8 qt. |
| Sugar | 6 lb. | 13½ cups |
| Milk | 5 lb. | 9½ cups |
| Eggs | 2 lb. | 19 |
| Vanilla | 2 oz. | ¼ cup |

*Directions:*

Stir sugar into the mix. Combine milk, eggs, and vanilla, and add 6 cups of the liquid to the mix. Stir 3 min. on "second" speed of mixer. Scrape. Add remaining liquid during 2 min. stirring on "low" speed in mixer. Bake in greased pans in a moderate oven (350°) about 35 min.

Note: If lard has been used in preparing the mix, the following instructions should be followed: Separate the yolks and whites of the eggs. Reserve about one-fourth of the sugar and beat it into the beaten egg whites to form a stiff meringue. Follow the other directions as given above. Stir in the meringue until well blended as the last step.

**Chocolate Cake**

Yield: 6 pans, 10 by 14 by 2½ in. Serving: 24 pieces/pan

| *Ingredients* | *Weight* | *Measure* |
|---|---|---|
| Mix | 8 lb. | 8 qt. |
| Cocoa | 1 lb. 6 oz. | 5 cups |
| Sugar | 7 lb. | 4 qt. |
| Milk | 7 lb. | 13 cups |
| Eggs | 2 lb. 4 oz. | 21 |
| Vanilla | 2 oz. | ¼ cup |

*Directions:*

Add cocoa to sugar and stir into the mix. Combine milk, eggs, and vanilla. Add 6 cups of the liquid to the mix. Stir 3 min. in mixer set at "second" speed. Scrape. Add remaining liquid during 2 min. stirring in mixer operating at "low" speed. Bake in greased pans in a moderate oven (350°) about 35 min.

Note: If lard has been used in preparing the mix, follow the special directions which are given for Yellow Cake.

**Orange Raisin Cake**

Yield: 6 pans, 10 by 14 by 2½ in. Serving: 24 pieces/pan

| *Ingredients* | *Weight* | *Measure* |
|---|---|---|
| Mix | 8 lb. | 8 qt. |
| Sugar | 6 lb. | 13½ cups |
| Liquid | | |
| Juice of 8 oranges and water to total | 5 lb. | 9½ cups |
| Eggs | 2 lb. | 19 |
| Chopped raisins | 2 lb. | 6 cups |
| Grated orange rind | From 8 oranges | From 8 oranges |

*Directions:*

Stir sugar into the mix. Combine liquid and eggs. Add 6 cups to the mix. Stir in mixer set at "second" speed for 2 min. Scrape. Add remaining liquid during 3 min. stirring on "low" speed of mixer. Add chopped raisins and grated rind. Bake in greased pans in a moderate oven (350°) about 35 min.

Note: If lard has been used in preparing the mix, follow the special directions which are given for Yellow Cake.

**Biscuits**

Yield: 275 biscuits

| *Ingredients* | *Weight* | *Measure* |
|---|---|---|
| Mix | 15 lb. | 15 qt. |
| Milk | 6 lb. 8 oz. | 3 qt. |

*Directions:*

Add milk to the mix all at once. Stir 45 seconds in mixer, set at "low." Knead 15 to 20 strokes on lightly floured board. Roll ½ in. thick. Cut. Bake on baking sheet in a hot oven (450°) 10 to 12 min.

**Molasses Cookies**

Yield: 12 doz.

| *Ingredients* | *Weight* | *Measure* |
|---|---|---|
| Mix | 3 lb. | 3 qt. |
| Sugar | 11 oz. | 1½ cups |
| Cinnamon | ⅛ oz. | 1 Tbsp. |
| Ginger | ⅛ oz. | 1 Tbsp. |
| Cloves | ½ oz. | 1 tsp. |
| Eggs | 5 oz. | 3 |
| Molasses | 2 lb. 3 oz. | 3 cups |

*Directions:*

Stir sugar and spices into the mix. Combine beaten eggs and molasses and add to the mix. Stir in mixer set at "low" speed for 2 min. Chill. Shape into balls and roll in extra sugar. Flatten on greased cookie sheets. Bake in a moderate oven (375°) about 10 min. Remove from sheet at once.

**Chocolate Drop Cookies**

Yield: 12 doz.

| *Ingredients* | *Weight* | *Measure* |
|---|---|---|
| Mix | 3 lb. | 3 qt. |
| Sugar | 2 lb. | 4½ cups |
| Cocoa | 6 oz. | 1½ cups |
| *or* Chocolate | 8 oz. | 8 squares |
| Milk | 1 lb. | 2 cups |
| Eggs | 7 oz. | 4 |
| Vanilla | ½ oz. | 1 Tbsp. |
| Nuts | 1 lb. | 3 cups |

*Directions:*

Stir sugar and cocoa or melted chocolate into the mix. Combine milk, beaten eggs, and vanilla and add about two-thirds of the liquid to the mix. Stir in mixer set at "low" speed for 1 min. Add remaining liquid and nuts and stir 30 seconds more at "low" speed. Drop from teaspoon onto greased cookie sheets. Bake in a moderate oven (375°) about 10 min. Remove from sheet at once.

**Coffee Cake**

Yield: 9 pans, 10 by 14 by 2 Servings: 15 pieces/pan

| *Ingredients* | *Weight* | *Measure* |
|---|---|---|
| Mix | 10 lb. | 10 qt. |
| Sugar | 2 lb. 10 oz. | 6 cups |
| Milk | 3 lb. 10 oz. | 6¾ cups |
| Eggs | 2 lb. | 19 |

*Directions:*

Stir sugar into the mix. Combine milk and beaten eggs, and add to dry ingredients. Stir until well blended (2 min. on "low" speed). Put into greased shallow pans. Cover with a topping. Bake in a hot oven (400°) 20 to 25 min.

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If lard is to be used as the shortening in the master mix, a smaller amount of shortening should be used. This may be 5 cups lard instead of 6 cups of other shortening. By weight 1⅝ lb. lard may be used instead of 2 lb. of other shortening. This would be ½ lb. less in every 6 lb. of shortening.

If lard, which requires refrigeration, is used in the master mix, the mix should be refrigerated. This mix can be used for all of the recipes, except for cakes, in exactly the same way as for the mix in which shortening which does not require refrigeration is used. The difference in the directions for mixing cakes is noted in the recipes.

### SUGGESTED VARIATIONS OF THE RECIPES USING THE MIX

The cake recipes accompanying the article lend themselves to many uses. "Upside down" cake using pineapple, peaches, cherries, apricots, other fruits, berries, or mincemeat can be made from the yellow cake recipe.

Variations of the cookies that can be made from the master mix are numerous. A dough such as that used for oatmeal cookies can be used for filled fruit bars. The recipes for drop cookies can be used as rolled cookies or ice box cookies if only one-half the amount of milk is used, or if the milk is omitted

and the amount of egg used is increased by one-half.

The biscuit dough can be used in many ways. For biscuit variations grated cheese, chopped parsley, chives, or herbs lend interest. The biscuit dough is rich enough for shortcake or for the top crust of a chicken or meat pie. It will serve as the dough for a meat roll—chopped meat bound together with gravy and spread over the dough, then rolled as a jelly roll and cut before baking. This may be served with gravy or with a cheese sauce. The dough can be used as the covering in baked apple dumplings or for the dough for a fruit or pinwheel roll. With the addition of one-sixth as much sugar as mix by measure (one-third as much by weight) and chopped fruit or berries stirred into the dough, it can be used for a steamed fruit pudding. For another similar variation, the sweetened biscuit dough can be dropped on top of hot stewed fruit or berries and baked. Or, it can be steamed as dumplings using fruit or berries in a sirup or a caramel sauce as the liquid to furnish the steam.

Although the lowest proportion of fat to flour used in making pastry approximates that in the master mix, pastry made from the mix is not satisfactory. The baking powder in the mix makes it porous instead of flaky. However, by using only water with the mix, one is able to make a type of pastry which can be used as a thin crust for meat pie or a deep dish fruit pie, or as the dough for a fruit dessert rolled as an uncut jelly roll. It takes about one-eighth as much water as mix by measure or one-fourth as much by weight to make such a pastry.

### ADAPTING RECIPES FOR THE MASTER MIX

The master mix can be used in other products, which have similar basic proportions, by modifying the recipes to use the mix instead of the dry ingredients and the shortening. A pound or a quart of mix contains approximately the following ingredients:

| *Ingredients* | *By weight* | *By measure* |
|---|---|---|
| Flour | 10.60 oz. | $2\frac{2}{3}$ cups all-purpose flour (or 3 cups soft wheat flour) |
| Baking powder | .50 oz. | 4 tsp. |
| Salt | .20 oz. | 1 tsp. |
| Cream of tartar | .05 oz. | $\frac{2}{3}$ tsp. |
| Shortening | 4.20 oz. | 9 Tbsp. |

A recipe containing almost half as much shortening as flour by weight or about one-fifth as much by measure could be adapted for use with the master mix. In order to have proportions in the mix that would be satisfactory for several types of baked products, the upper limit for shortening is approached in products such as biscuits and muffins and the lower limit in cakes and cookies.

### SUMMARY

The directions for preparing a master mix in quantity have been given, as well as ten recipes making use of the mix. From the discussion it can be seen that the use of this mix offers several advantages.

It is a time-saver, making it possible to prepare in advance for certain rush periods, thus "leveling" off the work during peak times in an institutional kitchen. Also, by using it, the actual time required in preparing baked goods is reduced.

The mix is flexible and can be used for biscuits, muffins, cakes, and cookies, and can also be adapted to other types of baked goods. As it was developed, the amount of shortening included in the mix approaches the upper limit advisable for such products as biscuits and muffins and the lower limit for cakes and cookies.

Because it has been standardized for preparation in six different quantities, the mix will be a material aid to those dietitians who have adopted the use of standardized recipes and can thus be instrumental in helping to achieve high quality and unvarying products.

### REFERENCES

(1) Billings, M., and Goetz, L.: Master mix. Better Homes & Gardens 26: 64 (January), 1948.

(2) Sunderlin, G., and Hostetler, R.: Master Mix. Purdue Extension Bulletin No. 344, 1948.

## INCREASING THE "INVISIBLE MILK" IN THE DAILY FOOD INTAKE

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In the light of the recent increase in the Recommended Dietary Allowance of calcium for adults from 0.8 to 1.0 gm. (1), dietary plans need revision, particularly with reference to the amounts of milk products included. The advice, "a pint of milk a day for adults," will no longer provide enough calcium to supplement the smaller amounts of calcium contributed by other foods in the American diet.

Other straws in the wind are these: supplies of calcium-containing foods are critically short (2); consumption of fluid milk is declining; and food prices are high. It is clear that availability and price as well as existing food habits must be considered in attempting to bring calcium intake at all age levels to the desired amounts. The recent revision has spotlighted attention on the calcium needs of adults, but the calcium needs of children are no less urgent.

In all types of diets, more milk may be provided by increasing the amounts of milk furnished by prepared dishes. Such "invisible milk" is frequently neglected in dietary surveys. With careful attention to daily meal plans as well as to the amounts of milk in individual dishes, the milk furnished by prepared dishes can make an important contribution. The amounts of other nutrients, as well as calcium, furnished by various dairy products must also be considered either in evaluating or improving diets.

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### AMOUNTS OF MILK IN PREPARED DISHES

An analysis was made of the relative amounts of milk per serving in prepared dishes. Included in the analysis were recipes from eight family cook books (3–10), four quantity cook books (11–14), and the 1936 edition of Rose and Taylor's food tables which specify ingredients for prepared dishes (15). The highest and lowest amounts of milk per serving for each recipe are shown in Table 1. It will be noted that a wide variation exists in the amounts of milk in different versions of recipes. For this reason, recipes were compared on the basis of only approximate amounts of milk furnished.

In Table 2, prepared dishes are classified according to amounts of milk furnished per serving within certain ranges—from ¾ to 1 cup, from ½ to ¾ cup, and so on.

In many cases a recipe selected from one cook book will furnish double the amount of milk, or more, per serving called for in the same recipe by another book. One cook book contained a recipe for cream of vegetable soup which furnished ⅙ cup per serving, while the same dish in another cook book yielded over four times that amount. From this alone it is clear that greater quantities of milk may be included in the diet by the selection of recipes high in milk.

The use of concentrated forms of milk, such as dry milk and evaporated milk, offers another means of increasing intake of the nutrients in milk. They have a special advantage in that they may be diluted by fruit, vegetable, and meat juices which might otherwise be discarded.

In regard to evaporated milk specifically, some recipes are especially suitable for use of the undiluted milk, which permits the inclusion of twice the usual amount of milk solids. In some such recipes, evaporated milk is used when cream is ordinarily specified—frozen desserts, certain types of cake, cake frosting, cookies, dessert sauces, and frozen salads. Undiluted evaporated milk may also be used in such dishes as meat loaf, sandwich fillings, mashed potatoes, and scrambled eggs.

### MILK NUTRIENTS IN OTHER DAIRY PRODUCTS

Although in this analysis of recipes, only bottled milk or its equivalent in evaporated milk or dry whole milk have been considered, important milk nutrients are furnished by other dairy products. Some of these have been compared in Table 3 on the basis of their content of calories, protein, calcium, vitamin A, and riboflavin, as well as the milk equivalent in terms of calcium content. From the standpoint of all nutrients considered, 1 cup of bottled milk (8 oz.) may be considered equivalent to ½ cup evaporated milk or 1 oz. dry whole milk.

One oz. of dry skim milk while lower in calories and vitamin A is more than equivalent to 1 cup bottled milk in protein, calcium, and riboflavin. The type of thin cream frequently used for coffee contains

TABLE 1

*Variation in amount of milk per serving in prepared dishes*

| RECIPE | CLASSIFICATION IN TABLE 2 | AMOUNT OF MILK | |
|---|---|---|---|
| | | In family cook books (3–10,15) | In quantity cook books (11–14) |
| | *cups/serving* | *cups/serving* | *cups/serving* |
| Beverages | | | |
| Chocolate malted milk | ¾ to 1 | — | — |
| Cocoa | ½ to ¾ | .500– .800 | .720–.857 |
| Coffee (with evaporated milk) | 1/10 to ¼ | — | — |
| Eggnog | ¾ to 1 | .333–1.000 | — |
| Cereals, breads, batters, and doughs | | | |
| Baking powder biscuits | Less than 1/10 | .062– .167 | .080–.160 |
| Bread made with milk (2 slices) | 1/10 to ¼ | — | — |
| Cereal cooked with milk | ½ to ¾ | .250–1.000 | — |
| Cereal, prepared, served with milk | ½ to ¾ | — | — |
| Griddle cakes | ¼ to ½ | .167– .500 | .258–.375 |
| Muffins | 1/10 to ¼ | .143– .167 | .160–.278 |
| Toast | | | |
| French | 1/10 to ¼ | .083– .333 | .120–.360 |
| Milk | ¼ to ½ | .333– .500 | — |
| Desserts | | | |
| Cake (plain) | Less than 1/10 | .042– .125 | .051–.125 |
| Candy made with milk | Less than 1/10 | — | — |
| Cookies | | | |
| Drop | Less than 1/10 | .002– .024 | .010–.042 |
| Rolled | Less than 1/10 | .001– .028 | .004–.007 |
| Gingerbread | Less than 1/10 | .071– .125 | .043–.056 |
| Pie | | | |
| Butterscotch | ¼ to ½ | .167– .417 | .250–.364 |
| Custard | ¼ to ½ | — | — |
| Pumpkin | ¼ to ½ | — | — |
| Puddings | | | |
| Bread | ½ to ¾ | .333– .667 | .333–.480 |
| Cornstarch (blanc mange) | ½ to ¾ | .333– .480<br>.250– .700 | .333–.667<br>.240–.360 |
| Custard, baked | ½ to ¾ | .250– .750 | .375–.480 |
| Frozen desserts made with evaporated milk | ½ to ¾ | — | — |
| Junket | ½ to ¾ | — | — |
| Rice | ½ to ¾ | — | — |
| Sherbets, milk | ¼ to ½ | — | — |
| Main dishes | | | |
| Cheese fondue | ¼ to ½ | .167– .400 | .167–.360 |
| Cheese rarebit | ¼ to ½ | .083– .333 | .120–.400 |
| Cheese sauce | 1/10 to ¼ | — | — |
| Cheese soufflé | ¼ to ½ | .125– .250 | .120–.320 |
| Chicken, creamed | ¼ to ½ | — | — |
| Dried beef, creamed | ¼ to ½ | .250– .500 | .360–.571 |
| Eggs | | | |
| Creamed | ¼ to ½ | .250– .500 | .320 |
| Deviled | Less than 1/10 | — | — |
| Scrambled | 1/10 to ¼ | .062– .333 | — |
| Fish loaf | 1/10 to ¼ | .083– .250 | .050–.222 |
| Macaroni and cheese | ¼ to ½ | .250– .556 | .160–.320 |
| Meat loaf | 1/10 to ¼ | .083– .417 | .056–.160 |
| Soups | | | |
| Creamed | | | |
| Potato | ½ to ¾ | .333– .750 | .480–.720 |
| Tomato | ½ to ¾ | .333– .667 | .480–.600 |
| Vegetable | ½ to ¾ | .167– .800 | .480–.720 |
| Oyster stew | ¾ to 1 | .500–1.000 | .720 |
| Sandwich filling | Less than 1/10 | — | — |
| Vegetables | | | |
| Creamed (in general) | ¼ to ½ | .167– .375 | .160–.280 |
| Potatoes, mashed | 1/10 to ¼ | .055– .167 | .152–.200 |
| Scalloped (in general) | ¼ to ½ | .167– .500 | .100–.320 |
| Cabbage | ¼ to ½ | — | — |
| Potatoes | ¼ to ½ | .333– .500 | .200–.320 |
| Potatoes au gratin | ¼ to ½ | — | — |

**There are 73 ways to brighten** the day of special diet patients . . . from breakfast through supper. You see, Gerber's nutritionists have prepared 73 appetite-tempting recipes—all in one helpful booklet.

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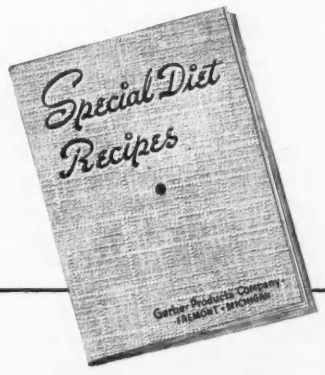


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TABLE 2

*Amounts of milk furnished per serving by various dishes*

| MILK PER SERVING | | | | |
|---|---|---|---|---|
| ¾ to 1 cup | ½ to ¾ cup | ¼ to ½ cup | 1/10 to ¼ cup | Less than 1/10 cup |
| Milk drinks | Cereal cooked with milk | Cheese dishes | Bread made with milk (2 slices) (6 lb. nonfat dry milk solids per 100 lb. flour. In family-size recipe, 1 cup milk per 1-lb. loaf) | Baking powder biscuits |
| Chocolate malted milk | Cereal, prepared, served with milk | Fondue | Cheese sauce | Cake, plain |
| Eggnog | Milk desserts | Macaroni and cheese | Coffee (5-oz. cup) served with 1 to 1½ tbsp. evaporated milk | Candy made with milk |
| Oyster stew | Bread pudding | Rarebit | Eggs, scrambled | Cookies |
| | Cornstarch pudding (blanc mange) | Soufflé | Fish loaf | Drop |
| | Custard, baked | Creamed dishes | French toast | Rolled |
| | Frozen desserts made with evaporated milk instead of cream | Chicken | Mashed potatoes | Eggs, deviled |
| | Junket | Dried beef | Meat loaf | Gingerbread made with sour milk |
| | Rice pudding | Eggs | Muffins | Sandwich filling |
| | Milk drinks | Vegetables | | |
| | Cocoamade with milk | Griddle cakes | | |
| | Soups, cream | Milk sherbets | | |
| | Potato | Lemon | | |
| | Tomato | Orange | | |
| | Vegetable | Milk toast | | |
| | | Pies | | |
| | | Butterscotch | | |
| | | Custard | | |
| | | Pumpkin | | |
| | | Scalloped vegetables | | |
| | | Cabbage | | |
| | | Potatoes | | |
| | | Potatoes au gratin | | |

greater amounts of calories and vitamin A than bottled milk, but only about three-fourths as much calcium, protein, and riboflavin. The Bureau of Human Nutrition and Home Economics (17) recommends that 1 oz. of Cheddar-type cheese be considered the equivalent of 1 cup of milk in calcium content. The riboflavin in 1 oz. of Cheddar cheese, however, is only about one-third the amount in a cup of milk. The Bureau also recommends that two to three large dips of ice cream be considered the equivalent of 1 cup of milk in calcium content.

## CONSIDERATION OF FOOD HABITS

The war gave impetus to studies of food acceptance which have their application to the problem of increasing milk consumption in prepared dishes. Studies of the food habits of various nationality groups in this country made under the auspices of the National Research Council (18–21) revealed that many of the diets were inadequate in milk. Suggestions for improving the diets were made on the basis of retaining the good points of the diets, and supplementing the deficiencies with foods and combinations most likely to fit into the existing menu pattern.

*Cereals.* Encouraging the consumption of cereal and milk combinations is a promising means of increasing the milk furnished by prepared dishes. Cereals, if only in the form of bread, are eaten daily by practically everyone in this country, regardless of region, economic level, or country of origin. The use of milk instead of water in cooking cereal and serving prepared cereal with milk can furnish at least ½ cup milk per serving.

Bread is capable of making an important contribution to daily milk intake. In bread containing 1 cup milk per 1-lb. loaf, the amount of milk furnished daily by six 1-oz. slices amounts to over ⅓ cup. Commercial bread frequently contains nonfat dry milk solids in amounts up to 6 lb. per 100 lb. flour. Thus six 1-oz. slices of commercial bread might supply the calcium equivalent of about ½ cup milk. It is difficult to evaluate the milk contributed by commercial bread, however, since labels do not usually specify the amount of milk included.

Batters and doughs vary in the proportion of flour to liquid; hence they vary in the amount of milk they furnish. Griddle cakes, made in the proportion of one to one, furnish more milk per serving (from ¼ to ½ cup) than biscuits, containing about ⅓ cup milk per cup flour (under 1/10 cup per serving).

*Beverages.* Even if an individual does not drink enough milk as a beverage, it is often possible to increase the amount of milk in the beverages he does consume. Coffee, for example, is probably the most popular American beverage for adults. Many persons use evaporated milk in coffee. Allowing 1 Tbsp. evaporated milk for each 5-oz. cup of coffee, a person consuming 3 cups of coffee per day will receive the equivalent of over ⅓ cup of bottled milk. Persons who use 1 Tbsp. thin cream in their coffee receive the calcium equivalent of about ⅙ cup milk

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84.9% — 6-12 years

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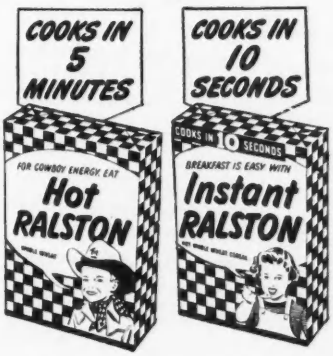


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TABLE 3

*Comparison of principal milk nutrients in common servings of certain dairy products**

| DAIRY PRODUCT | SIZE SERVING | CALORIES | PROTEIN | CALCIUM | VITAMIN A | RIBOFLAVIN | MILK EQUIVALENT IN TERMS OF CALCIUM CONTENT |
|---|---|---|---|---|---|---|---|
| | | | *gm.* | *mg.* | *I.U.* | *mg.* | *cup* |
| Milk | | | | | | | |
| Bottled | 8 oz. | 156 | 7.9 | 268 | 360 | .39 | 1.00 |
| Evaporated | 4 oz. | 157 | 7.9 | 276 | 455 | .41 | 1.03 |
| Dry whole | 1 oz. | 141 | 7.3 | 269 | 397 | .41 | 1.00 |
| Dry skim | 1 oz. | 102 | 10.1 | 369 | 12 | .55 | 1.38 |
| Cream, 20 per cent | 1 Tbsp. (15 gm.) | 31 | .4 | 15 | 124 | .02 | .05 |
| Ice cream, plain | $\frac{2}{3}$ cup (100 gm.) | 210 | 4.0 | 132 | 540 | .19 | .49 |
| Cheese | | | | | | | |
| Cheddar-type | 1 oz. | 111 | 6.8 | 248 | 495 | .14 | .93 |
| Cottage | $\frac{1}{2}$ cup (100 gm.) | 101 | 19.2 | 82 | 30 | .29 | .31 |
| Cream | 1 oz. | 104 | 2.0 | 85 | 628 | .04 | .32 |

* Food composition figures from *Tables of Food Composition in Terms of Eleven Nutrients* (16).

in three 5-oz. cups. Tea is another beverage which may be served with milk.

*Vegetables.* Another way of getting more milk in the diet is to serve almost any vegetable either creamed or scalloped. This plan will yield from $\frac{1}{4}$ to $\frac{1}{3}$ cup per serving. Potatoes, a deservedly popular vegetable, might be served more often with milk. Potato soup usually furnishes over $\frac{1}{2}$ cup milk per serving, and scalloped potatoes only slightly less.

*Main Dishes.* A great variety of main dishes containing milk are well accepted and can be frequently served. Milk soups may be included under this heading since they are usually hearty enough to be served as a main luncheon dish. Creamed and scalloped main luncheon dishes made with eggs, fish, meat, macaroni, spaghetti, and vegetables furnish about $\frac{1}{3}$ cup milk per serving.

Many dishes featuring cheese have the advantage of furnishing milk nutrients from both milk and cheese. If the cheese in these recipes is included in calculating a total milk equivalent in terms of calcium, most cheese recipes furnish well over 1 cup per serving. On the basis of riboflavin content, however, the milk equivalent is lower.

*Desserts.* Desserts have the decided advantage of being almost universally liked. Most milk puddings—such as blanc mange, custard, and bread pudding—furnish about $\frac{1}{2}$ cup of milk per serving, and certain pie fillings, such as butterscotch, pumpkin, and custard, contain only a little less. Most cakes and cookies, however, contain only small amounts of milk per serving.

## MILK-CONSCIOUS MENU PLANNING

For children, who need a higher proportion of milk in relation to total calories in most cases, some milk as a beverage is practically a necessity. If price or availability is a problem, other forms of milk than bottled pasteurized milk may be used. Studies have shown that children will readily drink reconstituted evaporated milk as a beverage with their school lunch (22, 23), and the Department of Agriculture is testing the use of nonfat dry milk solids for the same purpose in some areas.

Many adults refuse to drink milk as a beverage, and many drink no more than 1 cup daily. It is perhaps with this group that increasing the amount of milk in prepared dishes has its greatest value.

From 1 to 2 cups of milk can be furnished daily in a menu including cereal cooked or served with milk ($\frac{1}{2}$ cup or more), a milk-rich dessert such as a pudding or a cream pie ($\frac{1}{4}$ to $\frac{3}{4}$ cup), and a main dish high in milk, such as a milk soup, a cheese dish, or a creamed or scalloped dish (from $\frac{1}{4}$ to over 1 cup). Thin cream served with coffee (3 cups per day) may add the calcium equivalent of about $\frac{1}{6}$ cup, and if evaporated milk is used instead, the amount of all milk nutrients is equivalent to $\frac{1}{3}$ to $\frac{1}{2}$ cup milk.

Menus can be planned so as to supply a more or less regular amount of milk daily in prepared dishes in amounts necessary to supplement the milk consumed as a beverage. In many dishes the amounts of milk nutrients may be increased by the selection of recipes high in milk or by the use of concentrated forms of milk such as evaporated and dry milk.

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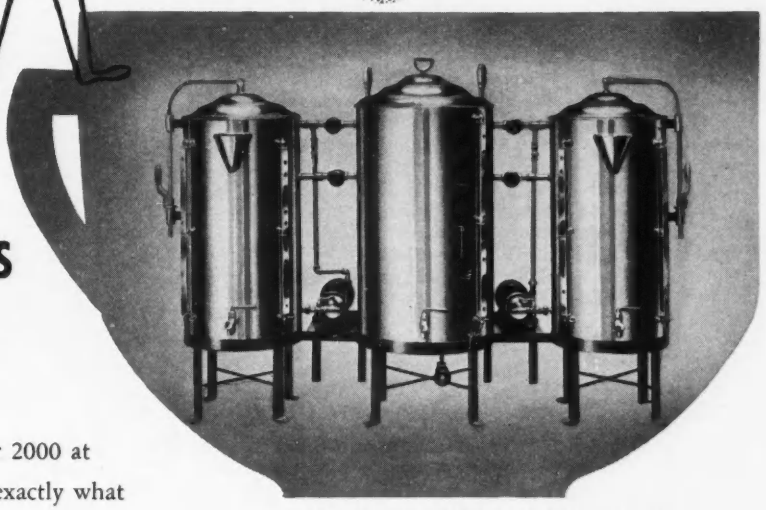

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## *New Appointments, Veterans Administration*

The following hospital appointments of dietitians (not previously announced) have been made by the Veterans Administration:

| Name | Position | Location |
|---|---|---|
| | *Branch No. 1* | |
| Margaret McKelliogott | Staff Dietitian | Newington, Conn. |
| | *Branch No. 2* | |
| Dorothy Brennan | Staff Dietitian | Canandaigua, N. Y. |
| Arlene Hugelmeyer | Staff Dietitian | Staten Island, N. Y. |
| Ada Montalvo de Irizarry | Staff Dietitian | San Juan, Puerto Rico |
| Evelyn Harris Ward | Staff Dietitian | Staten Island, N. Y. |
| | *Branch No. 3* | |
| Elizabeth C. Fidler | Staff Dietitian | Aspinwall, Pa. |
| Jean Petley | Staff Dietitian | Lyons, N. J. |
| Betty Spain | Staff Dietitian | Lyons, N. J. |
| Martha A. Wheatley | Staff Dietitian | Aspinwall, Pa. |
| | *Branch No. 4* | |
| Ardyce Rundquist | Staff Dietitian | Richmond, Va. |
| | *Branch No. 5* | |
| Dorothy L. Jett | Staff Dietitian | Tuskegee, Ala. |
| E. Pauline Landreth | Staff Dietitian | Memphis, Tenn. |
| Ruby Elizabeth Ledbetter | Staff Dietitian | Memphis, Tenn. |
| | *Branch No. 6* | |
| Marion F. Carter | Staff Dietitian | Dearborn, Mich. |
| Matense Kernoski | Staff Dietitian | Dayton, Ohio |
| Anne Virginia Kramolowsky | Staff Dietitian | Louisville, Ky. |
| Martha R. McCann | Staff Dietitian | Dearborn, Mich. |
| Mary H. McGuire | Staff Dietitian | Louisville, Ky. |
| Jo Murray Reynolds | Staff Dietitian | Dayton, Ohio |
| Elizabeth H. Schlichte | Staff Dietitian | Louisville, Ky. |
| | *Branch No. 9* | |
| Shirley Shipman | Staff Dietitian | Jefferson Barracks, Mo. |
| Marjorie Swan | Staff Dietitian | Wadsworth, Kans. |
| | *Branch No. 10* | |
| Virgie Kersten | Staff Dietitian | New Orleans, La. |
| Virginia Magliolo | Staff Dietitian | Dallas, Tex. |
| | *Branch No. 12* | |
| Alberta Etchells | Staff Dietitian | San Fernando, Calif. |
| Margaret Kolze | Staff Dietitian | Livermore, Calif. |

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# BANANA BRAN MUFFINS

Starts the day the energy way

Any left-overs, split and toast!

## How to make BANANA BRAN MUFFINS

| Scaling weight for 1 muffin:—2 ounces (No. 16 scoop) 2 muffins per portion | 5 lb. 2½ oz. mixture 40 muffins 20 portions | 25 lb. 12 oz. mixture 200 muffins 100 portions |
|---|---|---|
| **INGREDIENTS** | **WEIGHTS OR AMOUNTS** | **WEIGHTS OR AMOUNTS** |
| Flour | 1 pound (1 quart, sifted) | 5 pounds (5 quarts, sifted) |
| Baking soda | ½ ounce (1 tablespoon) | 2½ ounces (5 tablespoons) |
| Salt | ½ ounce (1 tablespoon) | 2½ ounces (5 tablespoons) |
| Sugar | 8 ounces (1 cup) | 2 pounds 8 ounces (1¼ quarts) |
| Bran flakes | 8 ounces (2 quarts) | 2 pounds 8 ounces (10 quarts) |
| or | | |
| Shredded bran | 8 ounces (1 quart) | 2 pounds 8 ounces (5 quarts) |
| Eggs | 6½ ounces (4) | 2 pounds (20) |
| Sour milk or buttermilk | ½ cup | 2½ cups |
| Melted shortening | 4 ounces (½ cup) | 1 pound 4 ounces (2½ cups) |
| Ripe bananas,* peeled | 2 pounds 4 ounces (10 to 12) | 11 pounds 4 ounces (50 to 60) |

*Use fully ripe or all-yellow bananas

Brown-flecked—right for eating

Bananas help keep bread and cakes fresh and moist

Sift together flour, soda, salt and sugar. Add bran and mix well. Beat eggs well. Add milk and shortening and blend. Add bananas, beating only enough to break them into small pieces. Add flour mixture, mixing only enough to dampen all flour. Bake in well-greased muffin pans in a moderate oven (375°F.) 30 to 35 minutes, or until muffins are done.

The bananas supply most of the liquid for these muffins. The batter is stiffer than usual for muffins.

If the 20-portion quantity is NOT made in a mixer, the bananas should be peeled and mashed just before they are added to the egg, milk and shortening mixture.

**Breakfast Menu**

Orange Juice
Scrambled Eggs
Crisp Bacon
Banana Bran Muffins
Beverage

Serve piping hot!

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# Book Reviews

**The Hospital Building.** Compiled and edited by Walter A. Taylor. Washington: American Institute of Architects, 1948. Paper. Pp. 71. Price $2.

This paper bound book is comprised of addresses on hospital planning given at the 1947 convention seminar of the American Institute of Architects and the Institute's Building Type Reference Guide No. 2, as originally published in its *Bulletin*.

To have this compilation of the addresses presented at a convention seminar of the American Institute of Architects is valuable not only for members of the architectural profession who are unfamiliar with hospital planning but for others involved in such planning. The authors are well qualified to express current trends in the thinking behind modern hospital construction. Emphasis is placed on the need for careful planning and functional design.

Roy Hudenberg describes the function of the councils of the American Hospital Association, particularly the Council on Hospital Planning and Plant Operation, in the development of standards as well as recommendations for practical means through which these standards may be achieved. He states, "A physical plant that has not been thoughtfully and carefully planned is certain to saddle a community with an economic burden that will limit its ability to provide proper patient care." This explains the interest of the American Hospital Association in the relationship between the architect and the hospital.

An interesting and informative paper by Maurice J. Norby, Assistant Director, American Hospital Association, includes the history of the Commission on Hospital Care, the collaboration of this Commission with the U. S. Public Health Service and pertinent facts concerning Public Law 725, the Hospital Survey and Construction Act. Mr. Norby emphasizes the importance of the architect in the creation of adequate and improved facilities for an expanding health service program.

The importance of the dietary department in the hospital and the need for well planned kitchens is brought out in a paper by Jacque B. Norman, Superintendent, Greenville, South Carolina, General Hospital. Mr. Norman's remarks are directed toward the need for functional design in all units of the hospital.

The architectural profession is well represented by William A. Riley, Perry B. Johanson, Isadore Rosenfield, Addison Erdman, and Carl A. Erikson. Mr. Riley discusses the information needed by the architect for hospital planning; Mr. Johanson brings out the value of flow charts in the study of traffic routes; and Mr. Rosenfield urges the architect to make a thorough study of each situation before attempting to interpret the clients' ideas. Space requirements for the individual units of a 200-bed hospital are indicated by Mr. Erdman. Although he gives an estimate of the space required for a serving pantry both for a centralized and and a decentralized tray service and for a tea room or lunch counter, he does not give estimates for the main kitchen or other dietary units. Mr. Erikson discusses the details of construction, such as walls, ceilings, floors, and so on. He states that the problem of food distribution is still a difficult one and that many methods may yet be tried.

The nurses' suggestions for improved planning are reported by H. Yvonne Ward, R.N., Assistant Secretary, American Nurses' Association, and Adelaide A. Mayo, Executive Secretary, National League of Nursing Education. The dietitians' suggestions are conspicuous by their absence.

The value of these papers to a dietitian would seem to be the background they provide for comprehensive hospital planning. With a better understanding of the picture as a whole, the dietitian can be prepared to contribute practical suggestions for improved kitchen planning.—*Wilma F. Robinson, Consultant Dietitian, Division of Hospital Construction & Services, Illinois Department of Public Health.*

**Encyclopedia Cookbook.** Edited by Ruth Berolzheimer. Chicago: Culinary Arts Institute, 1948. Cloth. Pp. 966. Price, $4.95.

Ten thousand recipes and 1000 photographs, many in color, thirty cookbooks in one—these are the claims to fame of the *Encyclopedia Cookbook*.

Tables of food terms, 2000 facts about food, and information on table settings, entertaining, pressure cookery, and menus are offered in this mammoth volume. Photographs of lavishly decorated foods adorn almost every page and the color photography is technical perfection. The entire volume is in the increasingly prevalent American tradition of "the biggest in the world" and "the most for your money."

For the homemaker who could have only one cookbook, this might solve problems. But, for the novice, it could easily prove frightening.—*Virginia Monahan Bayles, Instructor, Nutrition and Dietetics, University of Denver School of Nursing.*

**A Date With A Dish.** By Freda De Knight. New York: Hermitage Press, Inc., 1948. Cloth. Pp. 426. Price $3.

A delightful experience awaits those who read this unusual cook book. Many are the recipes which are new and really different.

The author of a *Date with a Dish* is the cooking editor of *Ebony*, popular Negro national magazine. From her recipe files and from traveling and living in many parts of the country, she has combined a book which not only presents some of the finest culinary achievements of outstanding Negro cooks and caterers, but adds some interesting descriptions of the cooks themselves. The "Little Brown Chef," pen-child of Miss De Knight, wanders through the southern catering centers, sniffs in New Orleans; tastes in Texas; nibbles in Cleveland, Buffalo, and Detroit; and roams around restaurants and hotels from California to Cuba.

Beginners will be pleased by simple recipes with easily understood directions. Gourmets will revel in unusual combinations, new flavors, and excellent menus. Peanut-butter muffins, coconut bread, jambalaya, watermelon sherbet, chess pie, sweet potato pudding, hearts of palm with cream, apricot bread, spoon bread, and damson plum pie are among the offerings in the "collectors' corner."

The dietitian who needs new ideas for cafeteria and patient menus, staff dinners and her own entertaining will do well to obtain a copy of *A Date with a Dish.—Virginia Monahan Bayles, Instructor, Nutrition and Dietetics, University of Denver School of Nursing.*

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# Current Literature

*Contributed by Janette C. Carlsen and Ethel M. Miller, Dietary Department, The Johns Hopkins Hospital; Quindara Oliver Dodge, Women's Educational and Industrial Union, Boston; and the Journal staff.*

## THE AMERICAN JOURNAL OF DIGESTIVE DISEASES

*Vol. 15, September, 1948*

* The treatment of obesity. M. A. Goldzieher.—p. 287.
* The influence of ascorbic acid, sodium ascorbate, calcium ascorbate and orange juice on dental enamel. S. L. Ruskin, A. T. Merrill, and O. Ruskin.—p. 303.

**The Treatment of Obesity.** The inconsistencies of the caloric and psychogenic interpretation of obesity are pointed out. Different treatment is needed by patients who overindulge in food and those who do not overeat. The first group requires education and psychotherapy and occasionally help by sedation and amphetamine. The metabolic causes of an increased appetite should be investigated and corrected. If food intake is not excessive, evidence of an endocrine disorder, especially a functional deficiency of the pituitary, should be sought. A treatment is outlined consisting of moderate dietary restrictions and the use of thyroid, mild diuretics, and pituitary extracts.

**The Influence of Ascorbic Acid, Sodium Ascorbate, Calcium Ascorbate, and Orange Juice on Dental Enamel.** Evidence is presented showing that the normal drinking of orange juice would not influence the enamel of teeth except where caries causation has already been produced. Under these circumstances it would appear to be extremely important that all cavities be promptly filled, particularly in children. The use of ascorbic acid should be replaced by a neutral salt, such as sodium or calcium, both of which fail to show any involvement of the dental enamel.

## ANALYTICAL CHEMISTRY

*Vol. 20, August, 1948*

* Determination of carotene in plant materials. A. Sreenivasan and V. M. Vaidya.—p. 720.

*Vol. 20, September, 1948*

Use of lyophilization in determination of moisture content of dehydrated vegetables. B. Makower and E. Nielsen.—p. 856.

*Vol. 20, October, 1948*

Glucose. G. H. Benham ad J. E. Despaul.—p. 933.

**Carotene in Plant Material.** A new and rapid method for the determination of carotene in plant materials has been developed. Green tissues are dehydrated, and chlorophyll and non-carotene pigments are strongly adsorbed in one operation by a combination of freshly ignited lime and anhydrous sodium sulphate. This method is especially suited for the determination of carotene in green and leafy vegetables. It may also be used with success for fresh fruits and vegetables except those like tomatoes, chilies, and papaya. The method may not lend itself for use with dehydrated products.

## BRITISH MEDICAL JOURNAL

*No. 4580, October 16, 1948*

* Deficiency of vitamin A in students. S. Doraiswami, V. S. Madras, and J. Yudkin.—p. 708.

*No. 4581, October 23, 1948*

* Significance of proteins in nutrition. D. P. Cuthbertson.—p. 731.

**Deficiency of Vitamin A.** The effect on dark adaptation of vitamin A supplements was observed in fifty-two women university students. Nine women showed a significant improvement of dark adaptation. A study of the dietary intakes of thirty-four students showed that the average daily intake of vitamin A of seven was below the average requirement. Thus both the measurement of dark adaptation and the assessment of the dietary intake reveal a similar proportion of subjects (about 20 per cent) who were probably consuming a diet deficient in vitamin A. It is impossible to say whether the proportion of deficient subjects was influenced by recent dietary restrictions, but the fact that approximately 20 per cent were deficient in vitamin A cannot be regarded lightly.

**Proteins in Nutrition.** This article presents a discussion of the quality of various proteins, the necessary allowance of proteins for health, and evidences of protein deficiency. The role of protein in the treatment of fevers, kidney disease, and trauma is presented. Undernourished patients who are awaiting operation should be put on diets which will meet their nutritional needs, since they may respond to dietary treatment more readily before operation than during convalescence. The statement is made that if a diet is adequate in calories, it will usually be adequate in proteins as well.

## THE CANADIAN MEDICAL ASSOCIATION JOURNAL

*Vol. 59, October, 1948*

* Nutritional problems in Canada. L. B. Pett.—p. 326.

**Nutritional Problems in Canada.** Nutritional problems in Canada may be classified as (a) problems of a general nature which will require long term programs for solution, and (b) problems of a specific nature which are of immediate concern. General problems include the lack of adequate training in nutrition in medical schools and the fact that most hospital diets do not even meet the minimum needs of patients, let alone provide the hyperalimentation that can contribute to early convalescence and reduce complications and mortality. The specific problems include malnutrition, vitamin deficiency diseases such as rickets and pellagra, and obesity and its many complicating factors. The immediate solution to these specific problems is discussed.

## ENDOCRINOLOGY

*Vol. 43, August, 1948*

* Antithyroid effects of food. M. A. Greer and E. B. Astwood.—p. 105.

**Antithyroid Effects of Food.** Sporadic goiter which occurs in a "goiter free" area where there is a relatively high concentration of iodine in the soil and water cannot be explained on a basis of iodine deficiency. There have been many theories on antithyroid activity of food. In this ex-

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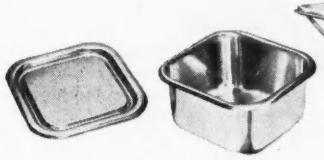

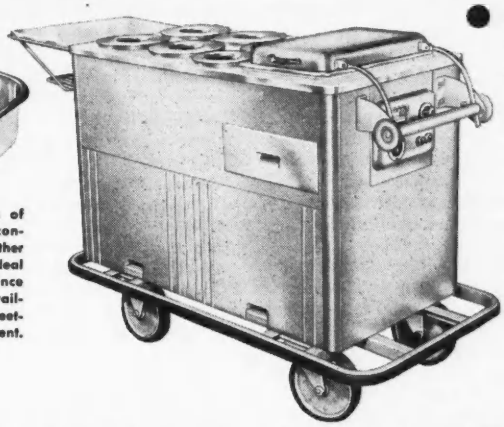

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periment sixty-one different foods were tested for the activity which would cause thyroid enlargement, in spite of an adequate iodine intake. Vegetables were found more active than animal foods. Rutabaga was the most active food. Others listed in order of their activity are: beets, spinach, lettuce, walnuts, peas, beans, apples, pear, strawberry, carrots and celery. Cow's milk, beef liver, and oysters showed some activity. The active principal of rutabagas could be extracted from a watery solution of ether and was contained in the water-soluble portion of this dried ether extract.

## THE JOURNAL OF THE AMERICAN MEDICAL ASSOCIATION

*Vol. 138, October 16, 1948*

* Therapy of chronic "atrophic gastritis" with eight years' gastroscopic control. L. H. Berry and T. J. Cole.—p. 485.
* Caloric undernutrition and starvation, with notes on protein deficiency. A. Keys.—p. 500.

*Vol. 138, November 6, 1948*

* Addition of vitamins to milk. Statement of the Food and Nutrition Board, National Research Council, Adopted May 8, 1948.—p. 749.

**Atrophic Gastritis.** Reported here are the observations which have been made on thirty-six patients with chronic atrophic gastritis who received therapy. A group of sixteen patients acted as controls. The subjects were of the poorest economic class, and their food intake was considerably below the standards of normal nutritional requirements, both as to quantity and quality. (It is pointed out, however, that probably some gastric atrophies are not of dietary origin.) The patients were divided into groups for the purposes of therapy. One group received injections of 1 cc. of B-complex intramuscularly each day for twelve days at a time. Another group received injections of liver extract. Four patients received daily injections containing 50 mg. of niacin. Another group received only dilute hydrochloric acid. The most dramatic response was noted in the patients receiving liver extract, the B-complex, and niacin. Improvement, although less dramatic was obtained in patients given the dilute hydrochloric acid. These observations provide further evidence of the therapeutic response of gastric mucosal atrophy to nutritional substances. It was found that atrophic gastric mucosa may regain and maintain normal appearance for seven years or more when followed by a normal diet. The condition in patients without pernicious anemia seems to be a part of a generalized nutritional deficiency syndrome rather than a result of a local inflammatory disease.

**Caloric Undernutrition and Starvation.** The paper presented here will be included in the *Handbook of Nutrition* and is mainly an abstract of parts of a book, *The Biology of Human Starvation*, which will be published by the University of Minnesota Press. The author indicates what sources of information on caloric undernutrition are available. The characteristic famine diets of European countries and/or southeastern Asia are described. It is pointed out that general undernutrition is widespread. Caloric requirements and recommendations are discussed. A differentiation is made between fasting and acute starvation. Particular attention is paid to protein deficiency and requirements. The physical and mental results of undernutrition are considered in detail.

**Adding Vitamins to Milk.** The Council on Foods and Nutrition of the American Medical Association has affirmed the opinion of the Food and Nutrition Board of the National Research Council concerning the addition of vitamins to milk. The statement which was prepared by the Food and Nutrition Board is presented.

## THE JOURNAL OF BIOLOGICAL CHEMISTRY

*Vol. 176, October, 1948*

* Studies on amino acid excretion in man. A. L. Sheffner, J. B. Kirsner, and W. L. Palmer.—p. 89.
* Further studies on a fat soluble material from plasma having biotin activity. W. Trager.—p. 133.

**Amino Acid Excretion in Man.** It is known that the fecal nitrogen of normal man remains relatively unchanged despite considerable variation in protein intake, provided the dried weight of food is kept constant. This study indicated that, despite great differences in the amounts fed, the total quantity of individual amino acids excreted in the feces remain comparatively constant. It is suggested that these fecal amino acids represent amino acids secreted into the lumen of the gastrointestinal tract as components of digestive enzymes, excreted as such or converted into bacterial protein before elimination from the body.

**Fat-Soluble Material from Plasma Having Biotin Activity.** Since oleic acid can replace biotin in the nutrition of *Lactobacillus casei*, other bacteria, and yeast, its effect in chicks was studied. Experiments reported here support the conclusion that hydrolyzed plasma, when given intramuscularly, yields a substance that has biotin-like activity in reducing dermatitis produced in young chicks by a diet high in egg white. The effect was not as great as that resulting from an injection of biotin. The leakage of saline-biotin from the needle or the incomplete absorption of the oil may account for this effect. The possibility that the oil from hydrolyzed horse plasma contains more substances with biotin activity should also be considered.

## THE JOURNAL OF CLINICAL INVESTIGATION

*Vol. 27, September, 1948*

* Studies in methionine and sulfur metabolism. I. The fate of intravenously administered methionine in normal individuals and in patients with liver damage. L. W. Kinsell, H. A. Harper, H. C. Barton, N. E. Hutchin, and J. R. Hess.—p. 677.

**Methionine in Liver Damage.** Methionine was selected for a study of amino acid metabolism in normal and hepatopathic individuals, by virtue of its prominent role in liver physiology. All patients received a standard high-protein, high-carbohydrate intake over a two-day period preceding the test, during which time all medication was discontinued. Methionine determinations were made on deproteinized filtrates of plasma obtained from heparinized blood. It was found that normal human subjects remove intravenously administered methionine from plasma at a predictable rate. This rate of removal is impaired in many individuals with liver damage. On the basis of the evidence presented, it seems probable that the rate of removal is synonymous with the rate of utilization. Under all conditions studied, the urinary excretion of *l*-methionine was negligible, while that of *d*-methionine was considerable.

## JOURNAL OF HOME ECONOMICS

*Vol. 40, October, 1948*

A comparative food cost study. D.H. Tuttle.—p. 451.

*Vol. 40, November, 1948*

* Helping children to accept evaporated milk. M. E. Hollinger and V. L. Dodd.—p. 507.
* Interest patterns give clues for guidance. B. J. Geiger and M. C. Evans.—p. 509.
* In-service training of school lunch staff. K. I. Sheehan.—p. 517.

**Acceptability of Evaporated Milk.** The study reported here is a continuation of one made previously. Reconstituted evaporated milk was included in the school lunch of an average of 3822 children in twenty-two rural schools in Louisiana. Records were kept by the teachers for one

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week to indicate how well the milk was accepted. It was found that 84 per cent of the children took servings of the milk, and 73 per cent drank at least one glass. The method of preparation of the milk was an influence on the acceptability. Best acceptance of the milk was found in the first, second, and third grades. Teacher influence was also very great; this study emphasized the need for instruction of elementary and high school teachers in nutrition education.

**Interest Patterns and Vocational Guidance.** If college home economics students are to be counselled wisely, accurate information must be available concerning patterns of interest and ability which are characteristic of home economists in different professions. A study was made at Indiana University to identify differences between the groups of home economics majors in dietetics, teaching, and textile merchandising. The Kuder Preference Record was employed as the measure of interest. The three groups resembled each other in the degree of interest in the mechanical, literary, musical, and clerical areas. For the dietetic group, the pattern seems to be high interest in scientific and social service activities, medium interest in computational and artistic activities, and low interest in persuasive activities. When these results were compared with those obtained in a similar study, it was possible to set up the following interest pattern as a gauge for students considering dietetics high scientific interest, at least medium computational and social service interests, medium artistic interest, and low persuasive interest.

**Training School Lunch Staff.** The school lunch staff, usually made up of untrained workers, needs training at regular intervals. A combination of demonstration-lectures and practical work should be provided for the cook and her assistants. Presented here are the underlying themes of a good training program, the objectives of training, and an outline to be used as a guide by the committee setting up the training program.

## THE JOURNAL OF NUTRITION

*Vol. 36, September, 1948*

* The vitamin A content of human blood plasma as an index of carotene utilization. E. Hartzler.—p. 381.

The distribution and fractionation of the monkey anti-anemia factor. W. R. Ruegamer, E. M. Sporn, U. D. Register, and C. A. Elvehjem.—p 405.

*Vol. 36, October, 1948*

* Response of dogs to liver extracts containing the pernicious anemia factor. W. R. Ruegamer, W. L. Brickson, N. J. Torbet, and C. A. Elvehjem.—p. 425.

* The cholesterol content of cow's milk. B. Nataf, O. Mickelsen, A. Keys and W. E. Petersen.—p. 495

The basal metabolism of two hundred and eighteen girls and young women of southern Arizona, fourteen to twenty-three years of age, inclusive. E. M. Thompson, E. W. Cox, and A. M. Ridgway.—p. 507.

**Vitamin A in Blood.** A single subject was placed on a diet low in vitamin A for three periods of 166, 80, and 115 days, respectively. Between these periods were two periods of moderate vitamin A intake of 73 and 163 days respectively. The level of carotene dropped rapidly each time the change was made to the diet low in vitamin A. The vitamin A level, on the other hand, did not show any significant change for 140 days, then dropped very gradually over a long period of time and finally made a rather abrupt drop. This drop was taken to indicate the end of the depletion period, and supplementation was begun. The feeding of increasing amounts of vitamin A resulted in a gradual increase in the vitamin A level in the plasma. This experiment demonstrated that the blood level can be used as an index for the study of the utilization of carotenoids by human beings.

**Response of Dogs to Liver Extract.** Young growing dogs were fed a niacin-deficient purified ration containing 1 per cent sulfasuxidine. When the animals developed symptoms of black tongue, they were given single doses of niacin. This therapy was found to be partially successful in combating loss of weight. Folic acid was found to play an important role in bringing about more consistent responses to niacin, but it had no apparent effect on the macrocytic anemia which developed progressively. Liver extracts rich in the pernicious anemia factor were effective in restoring the blood picture and general health of the animals. These extracts were only partially effective when given alone, but in combination with folic acid gave complete recovery. When higher levels of protein (24 to 30 per cent) were fed, however, the need for folic acid could not be shown.

**Cholesterol Content of Cow's Milk.** The results of this study showed that the mean cholesterol level in cow's milk was 11.4 mg. per 100 cc. for winter samples and 11.3 mg. for the summer milk. When the values for all the cows were considered, there was no significant difference between summer and winter milk. There was a considerable degree of correlation between the butterfat and the cholesterol content. From data presented, it was shown that there was no relation between the cholesterol content of the milk and of the blood serum.

## THE JOURNAL OF PEDIATRICS

*Vol. 33, September, 1948*

* The treatment of epidemic vomiting in pediatric practice. J. E. Bradley.—p. 318.

**Epidemic Vomiting in Pediatrics.** It is common in Baltimore and its environs to have patients, particularly children, who repeatedly vomit for 24 hr. or longer without exhibiting any positive physical findings. It has a seasonal incidence, being seen almost entirely during the months of October and November, or until onset of cold weather. The treatment found successful was Coca-Cola sirup given in teaspoonful doses at intervals of 15 to 30 min. until three or four doses have been retained. Usually there is no further vomiting after the initial dose. After the initial treatment, foods such as applesauce, gelatin products, pre-cooked cereals with sugar only, toast, and crackers are given. Fluids are limited. Additions of food after the initial 48 hr. include milk, fruit juice, broth, and baked potato. The continuation of a low-residue, low-fat, high-carbohydrate diet is advised for four more days. The theory of treatment is that the xanthine content of Coca-Cola sirup relaxes the smooth muscle of the stomach. Therapeutic doses of xanthines have no significant effect on gastric activity, but high concentrations do depress the tone and amplitude of contractions of the intestine.

## THE NEW ENGLAND JOURNAL OF MEDICINE

*Vol. 239, October 7, 1948*

* The use of the rice diet in the treatment of hypertension in nonhospitalized patients. A. W. Contratto and M. B. Roger.—p. 531.

**The Rice Diet and Hypertension in Nonhospitalized Patients.** Fifty-five patients with essential hypertension were selected for treatment. Twenty-one were excluded from the study because of non-cooperation and unwillingness to follow the strict dietary regimen. Three who developed coronary occlusion after starting the diet were also excluded. The subjects selected were all private, nonhospitalized patients who were able to continue their daily routine with the exception of their dietary habits. The rice diet was found to be a practical, inexpensive, and simple method for reducing blood pressure. However, it requires understanding and cooperation on the part of the patient to maintain it strictly. Frequent visits and the offering of suggestions and encouragement are invaluable in aiding the patient's adherence to the strict regimen. If modification is once allowed, it is usually impossible to get patients to return to the diet without modification.

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## SCIENCE

*Vol. 108, September 10, 1948*

*An experiment on human vitamin $B_6$ deprivation. W. W. Hawkins and J. Barsky.—p. 284

*Vol. 108, September 17, 1948*

The mechanism of cysteine and glutathione protection against alloxan diabetes. A. Lazarow, J. W. Patterson, and S. Levey.—p. 308.

*Vol. 108, October 15, 1948*

Isolation of pure vitamin $A_2$. E. M. Shantz.—p. 417.

**Human Vitamin $B_6$ Deprivation.** Experiments were carried out on an adult male who subsisted for two months upon a purified diet and received all necessary known vitamins with the exception of vitamin $B_6$. No changes occurred which could unequivocally be considered as resulting from a lack of this vitamin. There is the possibility, however, of albuminuria, of mental symptoms, and of white blood cell changes. It may be that human intestinal bacteria synthesize vitamin $B_6$-active compounds. A longer experimental period would have been desirable.

## AMERICAN RESTAURANT MAGAZINE

*Vol. 32, September, 1948*

Must make menus descriptive. L. Leber.—p. 84.
* What it costs to walk. R. D. Mock.—p. 90.
Employee attitude tells story. J. B. O'Meara.—p. 108.

**What It Costs to Walk.** An industrial engineer has translated walking time into terms of dollars and cents. His figures can be applied to various food service situations. For instance, it was found that in one restaurant it cost $5.08 a day just for the walking required to bring water to patrons. By installing additional water taps, this cost was cut by two-thirds. In many cases, minor changes in routine can effect marked savings in operating expense.

## BAKERS' HELPER

*Vol. 90, September, 1948*

* Visualization: transparent models for efficient plant layout. D. L. McIntyre.—p. 57.
* Pan of fancy cookies made in one-fourth time.—p. 114.

*Vol. 90, October 2, 1948*

* Soy goes aristocratic. W. E. Broeg.—p. 128a.

**Scale Models and Plant Layout.** The use of transparent plant models, constructed to scale, is discussed. Such models help in understanding a proposed layout or in visualizing what is wrong with the present layout. Plant models make it possible for the administrator of an organization to avail himself of the practical experience and understanding of many employees who cannot read blueprints. Production efficiency and safety of a proposed building can be more economically achieved in the finished layout when small scale models are used for planning.

**Fancy Cookie Mat.** A rubber mat has been devised which is cut with cookie-sized designs. Less than ¼ in. thick, the mat is fitted into a standard size cookie pan. After the batter is put into the pan, the rubber mat is lifted up and the cookies are shaped on the cookie sheet by the holes in the rubber mat. At present, twelve designs are available, six for pound cookies and six for larger cookies to be sold by the dozen. Only 30 seconds are required for placing the batter in the pan, removing the rubber mat, and sprinkling sugar or other decoration on the cookies.

**Soy Flour Spice Cakes.** Wartime shortages were responsible for the trail of soy flour in many fancy-pastry establishments, and the continued use of soy flour is due to its wide acceptance. The preferred use of soy flour is in spice cakes.

## COLLEGE AND UNIVERSITY BUSINESS

*Vol. 5, October, 1948*

It takes intelligence to handle student labor. M. R. Shaw.—p. 10.
Five steps to effective food buying. A. A. Frooman.—p. 28.

*Vol. 5, November, 1948*

* Seven keys to good management. A. B. Atkinson.—p. 16.
* How one small college sets up its food service. N. Gleason.—p. 19.
* When student labor is used. V. L. Kretschmer.—p. 21.
* Cafeteria planning and layout. A. G. Francis.—p. 23.
Newly fabricated for food storage. R. F. Herron.—p. 30.
* Maintenance of equipment. F. C. Shiel.—p. 33.

**Good Management.** Good management in college food service is dependent to a great extent upon understanding and application of the following seven procedures: (a) determination as to the amount of subsidy that will be furnished by the institution; (b) a budget guide for each type of service, such as cafeteria, snack bar, and catering; (c) an estimation of what may be expected in the way of income from each type of food service; (d) the importance of the menu, and its relation to marketing, food cost, utilization of equipment, and merchandising (the standard recipe also influences the success of the menu); (e) the effective utilization of labor, which involves job analysis, employee training, and work schedules; (f) sanitation control, including maintenance of equipment, control of cleaning materials, and laundry service; and (g) adequate supervision of the entire department.

**Food Service at a Small College.** The food service at Grinnell College, Grinnell, Iowa, has been streamlined and reorganized. Two kitchens serve the student body—one for women and one for men. The layout of these kitchens and the personnel are discussed, as are personnel policies. The responsibilities of the food service director and of the dietitians in the two kitchens are briefly described, and the dining room service is discussed.

**Student Labor.** At the University of Illinois it is the policy to employ as many students as possible. The major disadvantages to student employment have been as follows: (a) split work schedules and short work hours, and (b) inability to work out prearranged schedules. The author tells what methods have been used to minimize these disadvantages. In regard to student wages, particular attention is given to the cash bonus plan and to payment in meals instead of cash.

**Cafeteria Planning.** This article deals with the procedure involved in planning a cafeteria. The steps to be considered in such planning are enumerated under each of these topics: (a) determining the size of the cafeteria; (b) deciding upon the type of layout—the open kitchen or the enclosed kitchen; (c) arrangement of counters; (d) requirements for equipment; (e) labor-saving equipment; (f) other equipment, such as tray and napkin tables and menu boards; (g) building items, including floors, walls, ceilings, lighting, and ventilation; (h) special considerations, such as mop sinks, lavatories, special types of washers and driers, and dish dispensers; and (i) arrangement of equipment. Illustrated in the article are layouts for open and enclosed kitchens and for different types of counter turns.

**Equipment Maintenance.** The work of a maintenance man in a college kitchen is considered. Emphasis is placed on daily or periodic inspection and on the keeping of records. Attention is also given to summer duties which may involve insect and vermin control; wall washing, painting, and floor repairs; cleaning of hoods; cleaning of gas, electric, and steam cooking equipment; checking gear boxes of various machines; and examining the plumbing, steam traps, electric switches, and refrigeration machinery. The article indicates what a full program of maintenance of the kitchen and its equipment should be.

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## FOOD INDUSTRIES

*Vol. 20, August, 1948*

* Cheese, bacon go into franks.—p. 100.
* Protein hydrolysate—source of glutamate flavor. L. A. Hall.—p. 108.

*Vol. 20, September, 1948*

Better human relations. F. A. Magoun and J. M. Shipton.—p. 80.
* From mop bucket to sanitation bonanza. A. L. Freeman.—p. 82.
* Improved bread made from frozen dough. C. M. McPherson and M. W. Lamb.—p. 95.
Nutritional improvement challenges processors. H. Gee.—p. 100.

**Cheese Bacon Franks.** A new type of "hot dog" has been developed. It contains smoked bacon and mild Cheddar cheese. The manufacturing process for the new product is described.

**Flavoring with Protein Hydrolysate.** Rapid progress has been made in this country in the flavoring of foods with protein hydrolysates. The hydrolysates for foods are essentially of two types: complete acid-hydrolyzed proteins and acid-hydrolyzed proteins from which glutamic acid has been extracted. The report here is concerned primarily with the hydrolysates of the first type—the unextracted variety. The opinion is expressed that monosodium glutamate used alone is not entirely satisfactory for flavoring food products. Experiments have indicated that hydrolysates which have a combination of all the amino acids give a preferred quality rating, a more satisfying flavor, and a more acceptable taste than when only one amino acid is present. The possible exception is the use of monosodium glutamate in chicken soups. The use of various protein hydrolysates for flavoring and the need for more specific standards in evaluating them are discussed.

**Revolutionized Cleaning Program.** After much experimentation, a satisfying cleaning method which also reduces cleaning costs was adopted by one of the big food companies. The first investigations were made in the field of wet mopping, since this was one of the most expensive cleaning procedures. A more satisfactory mopping compound was found—a synthetic detergent—and then attention was turned to the efficiency of the mopping equipment. New mops were designed having pear-shaped handles and mop heads of cotton strands coated with cellulose sponge. Mopping machines were designed which were able to do five times the work a mop could do. By application of the improvements described here, great savings will be achieved.

**Bread from Frozen Dough.** The experimental technique is described by which it was possible to determine what factors influence the quality of bread baked from frozen doughs. Three steps were found to be effective in controlling quality: (a) use of correct ingredient proportions in the formula, (b) elimination of the dough rising step before freezing, and (c) thawing the dough in its original wrapper before shaping and baking.

## HOSPITAL MANAGEMENT

*Vol. 66, August, 1948*

Five steps to effective institutional food buying. A. A. Frooman.—p. 84.

*Vol. 66, September, 1948*

Five steps to effective institutional food buying. A. A. Frooman.—p. 106.

*Vol. 66, October, 1948*

Five steps to effective institutional food buying. A. A. Frooman.—p. 102.
* Just my miscellany. J. M. Melgaard.—p. 118.

**Sanitary Handling of Food.** It is the author's observation that in many public eating places food is handled very carelessly in regard to sanitary procedures. In order to correct this problem of lack of cleanliness in kitchens, several suggestions are made. They involve the following: (a) personal cleanliness and personal hygiene of food handlers, (b) proper facilities for washing hands, (c) cleanliness and safety in handling food, and (d) the psychology of cleanliness. A number of specific suggestions are made under each of these points.

## HOSPITALS

*Vol. 22, September, 1948*

* Procedures and suggestions for a 1949 food budget. M. Gillam.—p. 78.
Ideas to consider when using frozen meats.—p. 84.

*Vol. 22, October, 1948*

* Control factors of a simplified meal ticket system. T. J. McGinty.—p. 65.
* Winning patients' favor with the selective menu. W. C. Byers and K. E. Britton.—p. 66.

**Food Budget.** Outlined here is the procedure for developing a food budget. The budget is planned on the basis of the costs of the dietary department, which are grouped in the following four classes: (a) raw food costs, (b) salary and wages, (c) supplies and replacements of expendable equipment, and (d) indirect costs or overhead legitimately chargeable to the department. It is pointed out that such costs as those for social functions and infant formula room be separated from other dietary costs. Because factual data of past experience must be available to determine what a budget should be, the meal census is an important tool. Then, too, trends in prices must be anticipated. In addition to the numerous suggestions for setting up a budget, a step-by-step plan, in the form of illustrations, is presented to show a method of setting up statistical data and costs for recording the projected budget figures.

**Meal Ticket System.** A meal ticket system provides a thorough check on the number of meals served in a hospital cafeteria, whether it is operated on a cash basis or as a non-paying cafeteria. One important prerequisite is necessary—a reliable employee to take the responsibility. The method used at Lincoln General Hospital, Lincoln, Nebraska, is described. The equipment necessary to handle the work is listed, and a meal ticket is illustrated.

**The Selective Menu.** The Norton Memorial Infirmary, Louisville, Kentucky, has found that the selective menu has done much to improve public relations with the hospital patients. The mechanics involved in using a selective menu are described. The type of printed form used for the selective menu is illustrated. Much of the success of this type of menu is due to the work of one of the employees, a home economics graduate, who is called a visiting dietitian. This employee is the dietary department's daily contact with the patients. Food waste has been reduced considerably since the selective menu was introduced.

## HOTEL MANAGEMENT

*Vol. 54, September, 1948*

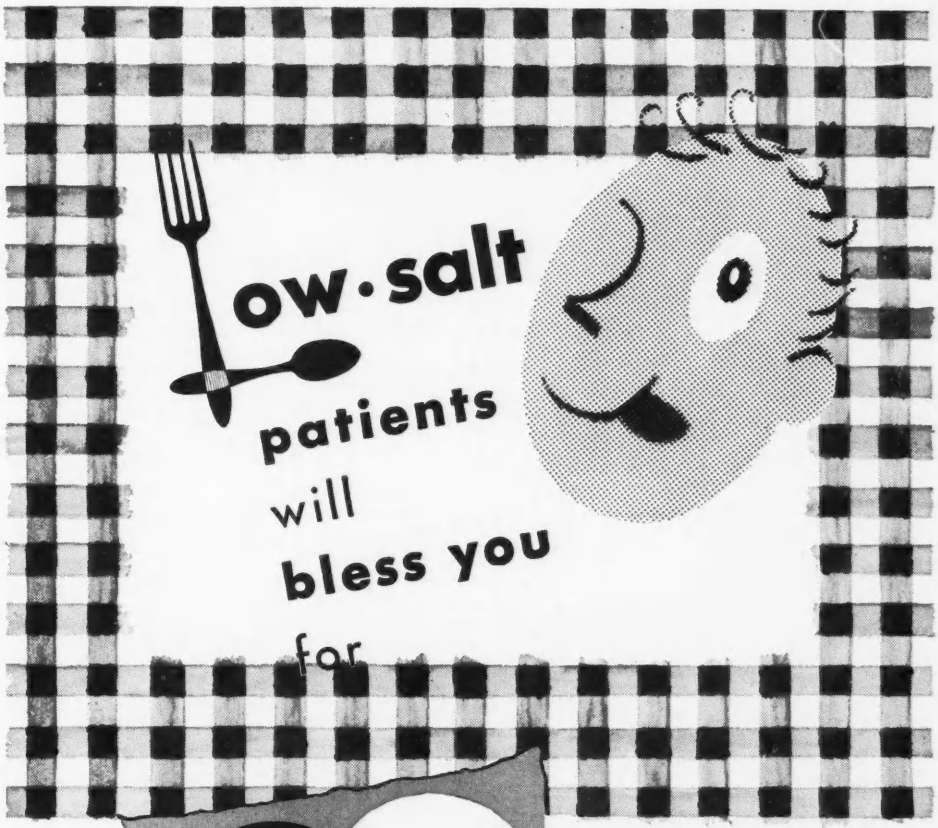
* Selling salads, sandwiches, and cold plates throughout the year. A. Easton.—p. 74.

*Vol. 54, October, 1948*

Five factors that affect the appetite appeal of food. A. Easton.—p. 84.

**Salads, Sandwiches, and Cold Plates.** This article deals with cold plates, bowl salads that make a whole meal, and to small salads to be served as part of a meal, not only in the summer, but at any time during the year. Menu combinations from well known restaurants are given. Also included are ten pointers for sandwich sales and suggestions for salad and sandwich combinations and accompanying hot breads.

**Appetite Appeal of Food.** This article discusses the five factors which affect the appetite appeal of food: contrast in color, form, flavor, texture, and temperature.

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# News Notes

**A.D.A. Executive Board Meetings.** The Executive Board of the American Dietetic Association met at the Hotel Statler in Boston, on October 15 and 16, with the President, Helen A. Hunscher, presiding. The reports of the officers, section chairmen, the Chairman of the Council of the House of Delegates, chairmen of special committees, and the staff members were read and accepted.

The Treasurer presented the budget and the recommendations of the Finance Committee. The proposed budget for 1948–49 was referred to the incoming Executive Board.

Tentative reorganization plans for the Association, proposed revisions of the Constitution, and the tentative outline for By-Laws were discussed.

A revised statement of the Mary Swartz Rose Fellowship Award, made to the Association by the Nutrition Foundation, was accepted by the Executive Board (see page 52 of this issue of the JOURNAL).

The committee formerly known as the Foreign Scholarship Committee was renamed the Foreign Student Advisory Committee. General plans for the guidance of the committee advising foreign students who wish to study dietetics in the United States were accepted.

Policies relating to approved dietetic internships were discussed. The Executive Board voted that the Educational Director review possibilities for establishing new internships in different sections of the country. The study is to be carried out after contact with the heads of home economics departments in colleges and universities.

It was voted that the Executive Board recommend twenty-four as a desirable *maximum* number of dietetic interns in an approved internship. It was also voted that internships having fewer than four dietetic interns accepted for training in April, 1949, should disband internships. It was agreed that notice of this action should be sent to directors of approved internships well in advance of the spring appointment date.

Plans were discussed for the economic study of dietitians to be conducted by the Bureau of Labor Statistics of the U.S. Department of Labor. Progress on the preparation of *The Bulletin on the Outlook for Dietitians* by the Women's Bureau, U. S. Department of Labor, was also reported.

On October 23, the 1948–49 Executive Board met at the Hotel Statler, Boston, Helen Walsh, presiding. Appointments of boards and committees were discussed and approved. The budget, as presented by the Treasurer and Chairman of the Finance Committee, was accepted.

Program plans for public relations, vocational guidance, and sections of the Association were discussion topics of special importance.

A suggested plan was presented for defraying expenses of Executive Board and staff members attending meetings of state dietetic associations.

**A.D.A. Constitution Amended.** On October 18 at the meeting of members of the American Dietetic Association in Boston, the following amendments were passed by vote of the members:

1. An amendment to said Constitution repealing the part of Article III, section 2, which provides for active members becoming life members; and
2. An amendment to said Constitution so that, after said amendment, the Constitution may be amended by the affirmative vote of two-thirds of the active members of the Association present in person or by proxy at any annual or special meeting of the members on certain conditions set out in the draft of amendment heretofore submitted to the undersigned.

**FAO Conference.** The fourth annual conference of the Food and Agriculture Organization met for two weeks in Washington from November 15 to 27. Delegates from the fifty-seven member nations attended, plus official observers from eight nonmember nations and a number of public international organizations. Some seventy other national and international organizations sent unofficial observers. Anne Stewart Miller represented A.D.A. as unofficial observer for our profession. During the first week of the Conference, Viscount Bruce of Melbourne, Independent Chairman of the FAO Council, pointed out to the Commission I of the Conference which considered the world food situation, that the pressing problems are better methods of increasing production, prevention of food losses, stabilization of prices of agricultural products and assurance of markets through international commodity agreements, and problems of underdeveloped countries. Commission II, which considered the work program of FAO, endorsed a number of projects of the Nutrition Division, including the holding in Cairo of a course for nutrition workers of the Near East countries early in 1949. It called for further active cooperation with the United Nations International Emergency Children's Fund and with the World Health Organization. It also recommended that FAO collect information on the nutritive value of food—mainly wild plants—used by primitive and remote peoples in various parts of the world.

Saudi Arabia's application for membership in FAO was approved, making it the fifty-eighth member of FAO. The Conference also approved the application of the Holy See for status as a permanent observer at FAO Conferences and meetings.

**New UNESCO Director.** Jaime Torres Bodet, Mexican Foreign Minister, has been chosen as Director-General of the United Nations Educational, Scientific and Cultural Organization. He replaces Dr. Julian Huxley of Britian.

**American Oil Chemists' Society Convention.** The nutritional aspects of glyceridic and edible oils and the large part they play in the national economy were examined at the convention of the American Oil Chemists' Society held in New York, November 15 to 18. In addition to emphasis on the glyceridic oil field, fifty-four other technical papers by expert chemists were presented during the four-day session covering soap and detergents, the analytical side of oil chemistry, drying oils, industrial uses of fatty oils and acids, research, nutrition, and antioxidants.

An important feature was the general session which comprised a report on "Certain Aspects of Food Standardization After Ten Years Under the New Food and Drug Act," presented by A. N. Gilbert of the New York law firm of Davis and Gilbert. Mr. Gilbert has been active in connection with hearings on the standardization of foods, including those which resulted in adoption, in 1941, of the federal standard for oleomargarine, and those in November, 1947, and January, 1948, on the basis of which standards for mayonnaise, salad dressing, and French dressing—all edible fat products—are promulgated. Another paper of interest in the field of nutrition was presented by Dr. Charles Glen King, Scientific Director of the Nutrition Foundation, who discussed "Nutrition in Relation to Glyceridic Oils."

**Seton Hill Inaugurates New President.** Seton Hill College of Greensburg, Pennsylvania, inaugurated William

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Granger Ryan as the sixth president of the college on November 11. The inaugural address was given by George Nauman Shuster, President, Hunter College of the City of New York. As representative of A.D.A., Melva B. Bakkie, Carnegie Institute of Technology, Pittsburgh, attended these ceremonies.

**American College of Surgeons Sectional Meetings.** Six, two-day sectional meetings will be held between January 7 and April 13 for physicians and surgeons and professional personnel of hospitals by the American College of Surgeons. A seventh meeting to be held in the West the latter part of April will be announced later. The latest developments in medical science and in hospital service will be presented at each meeting. The schedule follows:

| *Date* | *City* |
|---|---|
| January 7–8 | Edgewater Park, Miss. |
| January 14–15 | Houston, Tex. |
| February 11–12 | Kansas City, Mo. |
| March 15–16 | Washington, D. C. |
| March 21–22 | Buffalo, N. Y. |
| April 12–13 | Edmonton, Alta., Canada |

Conferences for the hospital personnel and for the medical groups will run concurrently. At joint morning meetings of the two groups each day medical motion pictures will be shown, followed by separate sessions. Separate afternoon sessions will be held. There will be a dinner meeting followed by a round table conference on the first evening.

**Gorgas Award in Preventive Medicine.** The annual Gorgas Award for outstanding work in preventive medicine was made to Brigadier General Edgar Erskine Hume at the annual dinner of the Association of Military Surgeons of the United States on November 12. General Hume, as Chief of Allied Military Government of Italy during the war, stopped the typhus epidemic in Naples in the first large scale use of DDT in history. The Gorgas Medal and $500 cash award is given annually through the Association by Wyeth Incorporated.

**More Nutrition Grants Awarded.** The Nutrition Foundation, Inc., has announced that ten new grants and sixteen renewals amounting to $185,600 have been made to colleges and universities for additional research in nutrition. Grants totaling $1,810,730 have now been made to sixty-two universities and medical centers. Most notable advances which have resulted from research made possible by the Foundation have been in regard to hypertension, anemias, tooth decay, and protein deficiency. Substantial contributions have also been made in the field of inquiry concerning high blood pressure and arteriosclerosis.

**Nutrition Clinic Course at Harvard for VA Dietitians.** A special course of training for dietitians in the Veterans Administration is being conducted November 22 through January 29 at the Harvard School of Public Health. Fifteen Veterans Administration dietitians from the various branch areas are attending this course which is on the graduate level. The curriculum has been planned so as to be directly applicable to the problems of applied nutrition as they are actually encountered in Veterans Administration nutrition clinics.

Because of the importance of nutrition education as a part of the total medical care and consequent rehabilitation of veterans, the work of the clinic dietitian has become more and more important. Yet, there has been an insufficient supply of hospital dietitians who are adequately trained in this phase of activities. For this reason, this concentrated short course was planned.

Dietitians studying at Harvard will receive work in principles and methods of adult health education, problems of changing human behavior as applied to food habits, methods of evaluating results of teaching, interviewing techniques, and effective use of audio-visual aids. In addition, the class work has been supplemented during the holiday period by field work. This phase of the activities of the course took place at the Boston Dispensary, the Children's Health Clinic, the Forsyth Dental Infirmary, and the following hospitals: Massachusetts General, Peter Bent Brigham, Beth Israel, Boston Lying-In, and New England Deaconess.

Upon completion of the course the dietitians receiving this training are to assist in the organization and further progress of the nutrition education program within their respective branch areas.

## *U. S. Public Health Service Examination for Dietitians*

A competitive examination for appointment of dietitian officers in the Regular Corps of the U. S. Public Health Service will be held on February 28, 1949 at various points in the U. S. Appointments will be permanent in nature and will provide opportunities for a lifetime career in the field of dietetics in the U. S. Marine Hospitals and other facilities of the U. S. Health Service.

Appointments will be made in the grades of Junior Assistant (corresponds to 2nd Lt. in the Army), Assistant (1st Lt.), and Senior Assistant Dietitian (Capt.). Annual entrance pay is from $2955.50 to $4489, as determined by the grade of appointment and existence of dependents. All applicants must be graduates from an approved college and have a baccalaureate degree in the field of dietetics.

Additional information and application forms may be obtained by writing to: Surgeon General, U. S. Public Health Service, Washington 25, D. C.; Attention: Division of Commissioned Officers.

**City of Chicago Begins Nutrition Program.** As a direct result of the Chicago-Cook County Health Survey conducted by the U. S. Public Health Service, a Nutrition Section has been established in the local health department. Dr. Adelaide Spohn has been loaned by the Elizabeth McCormick Memorial Fund to the Health Department as Chief of the Section, and the health department has employed Margaret Garibaldi and Isabelle Goldsmith, nutritionists, to staff the section. At the request of Dr. Herman N. Bundesen, President, Board of Health, an Advisory Committee to the Nutrition Section has also been organized. The Advisory Committee is representative of many fields interested in nutrition education in Chicago. It is composed of the following members:

Dr. Franklin C. Bing, Director, American Institute of Baking

Dr. James R. Blayney, Director, Zoller Dental Clinic, University of Chicago

Margaret Hessler Brookes, Home Economics Department, University of Chicago, representing Chicago Nutrition Association

Dr. Clifford S. Grulee, Secretary and Treasurer, American Academy of Pediatrics

Dr. Robert W. Keeton, Head, Department of Medicine, University of Illinois College of Medicine

Dr. William Dieckman, Chairman and Chief of Services, Department of Obstetrics and Gynecology, Chicago Lying-in Hospital

Dr. F. V. Meriwether, Director, District #3, U. S. Public Health Service

Louise Mojonnier, Chairman, Home Economics Department, Illinois Institute of Technology

Mary E. Murphy, Director, Elizabeth McCormick Memorial Fund

Alexander Ropchan, Executive Secretary, Health Division, Council of Social Agencies

Dr. Tom Spies, Head, Nutrition Department, Northwestern University

Dr. Charles J. Thill, Clinical Dean, Loyola University School of Medicine

Dorothea F. Turner, Assistant Professor, University of Chicago Clinics, and Editor, *Journal of the American Dietetic Association*

At the first meeting of the committee on October 28, the proposed nutrition program was adopted. This program included a long-term plan and described the portion of the program which can be carried out with the present staff. A sub-committee was appointed to plan a program using volunteer workers until more staff is available.

**Drexel Home Economics Guidance Meeting.** A Symposium on Guidance and Education for Careers in Home Economics was held at Drexel Institute of Technology on November 20. Included in the symposium were viewpoints

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given by junior and senior high school guidance counselors, secondary school administrators, home economics teachers in high school and college, a business man, and a Drexel student whose major is home economics. The principals, teachers, and counselors help to amplify the need for professional home economists in business, hospitals, and teaching. It was also pointed out that the home economics field should become the interest of men, too, for homemaking today should be the concern of both husband and wife. The inclusion in the home economics curriculum of a home mechanics course for girls was also recommended.

In discussing high school guidance work, Dorothy Berger, Counselor at Norristown Senior High School, described a three-year plan for career conferences. The first year should be a regular conference at the school to arouse interest; the second year, industry should be invited to come into the school bringing personnel and display material to tell the career story; and in the third year, there should be visits to industry, thus allowing the student to meet and see the people on the job.

Lois Helman, Instructor of Home Economics, Drexel Institute, discussed the ways in which the college could assist the counselor in carrying out such a three-year plan. She recommended the preparation of bulletins addressed to the high school students and counselors, visits to the schools at career conferences, and an open house plan at the colleges for high school students. She outlined more than eighty career possibilities in home economics.

**Helen Robertson Honored.** At the annual meeting of the Grocery Manufacturers of America, Inc., held in New York in November, the first annual "Life Line of America Trophies" were awarded. The trophies were presented in recognition of "distinguished contribution to furthering understanding of the 'Life Line of America,' a line of essential processes between food in the field and food on the table." Three trophies will be presented each year, one each to a food editor of a newspaper, a woman editor of a farm publication, and a woman broadcaster. This year, the recognition honoring the food editor of a newspaper went to Helen Robertson of the Cleveland *Plain Dealer*. Miss Robertson is a well known and active member of A.D.A. having served as chairman of the Public Relations Committee in 1946–47, and Co-Chairman in 1947–48.

Mavis Gibbs of *The Southern Planter* Richmond, Virginia, received the award for the woman editor of a farm publication, and Heloise Parker Broeg of Station, WEEI, Boston, was the woman broadcaster who was honored.

**Dr. Cowgill Also Honored.** At the same meeting, George R. Cowgill, Ph.D., Professor of Nutrition, Yale University, New Haven, Connecticut, and Editor, *Journal of Nutrition*, received the 1948 Award for Scientific Distinction of the Grocery Manufacturers of America. He was cited for "fundamental contributions to the science of nutrition, particularly his research on the fundamental role of vitamin $B_1$, his success as a teacher of young biochemists, and his outstanding editorial work for the *Journal of Nutrition*.

**Government Publications.** The *Bureau of Agricultural Economics, U.S.D.A.*, has published a condensed form of its recent publication on consumer preferences for potatoes (Misc. Pub. No. 667, listed in this JOURNAL in the November issue). In the condensation—an eight-page leaflet titled "People and Potatoes"—are summarized the most important points brought out in the larger, more detailed publication. The data should be of value to all those interested in people's buying and eating habits.

The *Children's Bureau* has just issued a new pamphlet titled "A New Look At Child Health" by Dr. Brock Chisholm, Executive Secretary, Interim Commission World Health Organization. It may be obtained from the Govt. Printing Office, Washington 25, for 10 cents per copy.

**Available from the A.D.A. Loan Library.** The following publications recently received in the A.D.A. office are available for loan to members:

(a) "Approved Films on Food and Nutrition," New York City Food and Nutrition Committee, 1948.

(b) "Health Films Catalog," (an annotated list), Educational Library Association, New York City, 1947.

(c) A set of six attractive pamphlets prepared by the Mississippi State Board of Health. The first pamphlet is entitled "Nutrition Services for You." Four of the pamphlets are done in color and carry these titles: "A Good Food Ticket for You," "Food for Growing Up," "What is Your Mirror Appeal?" and "Eat Well to Get Well." The sixth pamphlet—in the form of a placard—gives information on what to do before and after the baby comes.

**Slides to Be Loaned.** Mary Harman Riste who spoke at the A.D.A. convention on "Let's Give Our Food a New Look" has announced that after January 15 the slides which she used to illustrate her address will be available for loan purposes for a limited time. Mrs. Riste is Chief Dietitian, Butterworth Hospital, Grand Rapids, Michigan. The slides show arrangements for trays designed to make food appetizing to the patient.

**Correction.** The JOURNAL regrets an error which appeared in its November issue on page 1004. Under the heading "New Formula for Enriched Bread" the development of a new formula was credited to the New York State Department of Health. It was, instead, the New York State Department of Mental Hygiene which has done this work.

**Julia Lovdall.** An announcement in the fall issue of the Connecticut Dietetic Association News Notes tells of the death of Julia Lovdall of Aetna Life Insurance Company, Hartford. Miss Lovdall was accepted for membership in A.D.A. in November, 1947.

**Plentiful foods.** The following foods are expected to be plentiful in January, according to the Production and Marketing Administration of the Department of Agriculture.

*Fresh produce and fruits*

| | |
|---|---|
| Cabbage | Cranberries, fresh and processed |
| Carrots | Pears, winter |
| Citrus fruits, fresh and processed | Potatoes, Irish |
| | Spinach |

*Miscellaneous foods*

| | |
|---|---|
| Beans | Peas, canned and dried |
| Cheese | Peanut butter |
| Corn products | Pecans |
| Fish, fresh and frozen | Oat products |
| Honey | Prunes, dried |
| Peas | Raisins, dried |

**Fortification of Apple Juice.** Recent improvements in processing and fortifying apple juice with ascorbic acid not only help hold the freshness of the juice, according to the New York State Experiment Station, but also make it equivalent to citrus juices in this essential vitamin. Tests of many samples of apple juice which were pressed, prepared, and pre-

## *Army Announcements Concerning Personnel*

The War Department has released the following official list of names of Medical Department Dietitians (not previously announced) who have been separated from service:

*Captain*

Audre E. Pawlicki, R-1009, 373 Fourth St., Manistee, Mich.

*First Lieutenants*

Evelyn A. Day, R-10021, 126-43 148th St., South Ozone Park, New York 20, N. Y.
Ann M. Larche, R-1358, 1863 Clarkson St., Denver, Colo.
Jane A. Oliver, R-10026, Portersville, Pa.

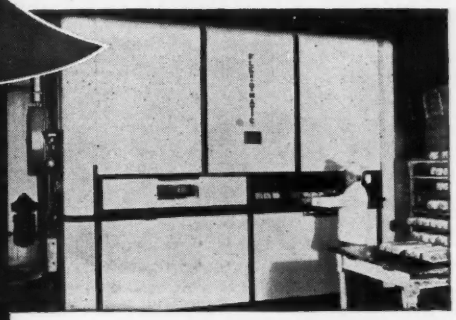
First Lieutenant Mildred F. McElreath, R-191, previously separated from the service, has been recalled to active duty.

Allen C. Brown, R-2543, has been appointed Second Lieutenant in the Women's Medical Specialist Corps Reserve and is serving on active duty.

**COLLEGE**
The dining halls of a famous southern school are served from this modern GAS kitchen →

# FOR PERFECT RESULTS IN VOLUME COOKING GAS HAS GOT IT!

**HOSPITAL**—This modern, automatic revolving tray GAS oven supplies a mid-Western state hospital with bread and other baked goods ↓



**OPPORTUNITIES** for profit, and for the application of money-saving ideas, offer a constant challenge to alert food service executives concerned with volume cooking.

Since every ingredient is a vital element in budget control, including fuel evaluated on a cost-per-service basis, GAS and modern Gas Equipment are particularly important factors.

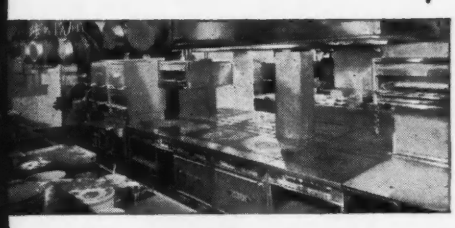
GAS is an economical fuel, singularly applicable to volume cooking operations because it is so flexible and so readily controlled. Modern GAS cooking tools, reflecting the characteristic advantages of GAS, are simple, easy to clean, and inexpensive to maintain.

Every volume cooking and food service function is a logical task for GAS. Compared with other available fuels GAS is unequalled for

- roasting
- deep-fat frying
- coffee brewing
- baking
- vegetable steaming
- steam kettle cooking
- toasting
- broiling
- sterilizing

You'll find efficient, modern Gas Equipment to serve every one of your volume cooking requirements. Your Gas Company will aid you in selecting the most suitable type and size.

**HOTEL**—One of the great hotels in the Pacific Northwest installed this sparkling stainless steel GAS kitchen to meet increasing demands on its food service department ↓



**YWCA**—Patrons of this well-known YWCA are served Southern delicacies from this compact GAS kitchen ↓

**CLUB**
An exclusive eastern club, famed for its food, recently modernized its facilities by installing this modern GAS kitchen →

**AMERICAN GAS ASSOCIATION**
420 LEXINGTON AVENUE, NEW YORK 17, N. Y.

served in different ways showed that raw apple juice fortified with ascorbic acid and preserved by freezing was most nearly like fresh apples in quality. Freezing plus fortifying was effective in preventing the raw apple juice from darkening and taking on a musty flavor. In general, the colder the storage and the larger the quantity of ascorbic acid added, the lighter was the color and the better the flavor. Samples stored at −6°F. were superior to those stored at 15°F. The tests also showed that chilling the apples before pressing helped in retaining fresh color and flavor. With pasteurized juice, however, fortifying with ascorbic acid before freezing appeared to have no consistent effect on color. Cold temperature for storage was important, and for storage longer than three months, freezing was an advantage. The pasteurized samples stored at temperatures from 34°F. to −6°F. were superior to those stored at room temperature.

## *News of State Associations*

**Alabama Dietetic Association.** On November 20, the Alabama Dietetic Association met in Montgomery. Speakers on the program were: Dr. Benton S. Marsh, Veterans Hospital, who talked on "The Low-Sodium Diet," and Dr. R. W. Engle of Auburn Polytechnic Institute, whose topic was "Recent Advances in the Study of Folic Acid and Vitamin $B_{12}$." Reports of the A.D.A. meeting in Boston were also given.

The *Tuscaloosa Dietetic Association* will continue to work on vocational guidance as its project for the year.

**California Dietetic Association.** The fall meeting of the *Bay Section* of the California Dietetic Association was held in Oakland on November 16. Honored guests, among the eighty-five present, were Lulu Graves, first President of A.D.A., and Helen Walsh, this year's A.D.A. President. Miss Graves talked on the first meetings of the A.D.A.

**Connecticut Dietetic Association.** The annual meeting of the Connecticut Dietetic Association was held at the Hospital of Saint Raphael in New Haven on December 2. Reports of the A.D.A. convention in Boston were made as well as reports of section activities. The program included "Public Relations for the Dietitian" by Jane Stewart, representative of the J. Walter Thompson Company; "How to Cut Hospital Food Costs" by Roseleen Hyman, Department of Nutrition, Hospital for Joint Diseases, New York City, and "What's Cooking in Cooking Equipment" by John J. Bourke, American Gas Company. Sister Jean Dolores, Nutrition Director at Hospital of Saint Raphael, turned the presidency of the Association over to Dr. Martha Potgieter, Professor of Nutrition, University of Connecticut. The following officers were elected: Lucille Refshauge, President-Elect, and Edith Cushman, Vice-President.

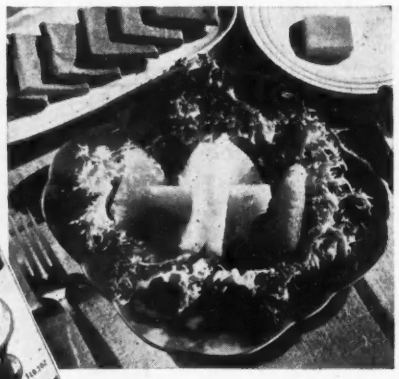
**Illinois Dietetic Association.** The fall meeting of the Illinois Dietetic Association was held at the Hotel Moraine on the Lake, Highland Park, November 18 to 20. Thelma Porter, Department of Home Economics, University of Chicago, spoke on "A Few Comments on Recent Nutritional Research"; Dr. Robert L. Jackson, Associate Professor, State University of Iowa, talked on "Rheumatic Fever and Its Relationship to Environment and Nutrition"; Dr. Theron G. Randolph, Northwestern University School of Medicine, talked on "Food Allergy"; Marion C. Bollman, Food and Container Institute, Chicago, discussed "The Application of Electronic Cooking to Large-Scale Feeding"; Miriam Thomas, also of the Food and Container Institute, spoke on "The Effect of Electronic Cooking on Nutritive Value of Food"; A. G. Francis, Illinois Bell Telephone Company, talked on "Sanitation and Safety"; Dr. H. W. Schultz, Nutrition Research Division, Swift and Company, discussed "Nutritional and Biochemical Research in the Food Industry" and John J. Bourke, American Gas Association, spoke on "What's Cooking in Cooking Equipment."

**Indiana Dietetic Association.** The Indiana Dietetic Association held its annual fall meeting and dinner in the Indiana University Union Building at Bloomington on November 11. Norris Wentworth spoke on "The Role of the Dietitian in Residence Halls." Martha Nelson was honored at this meeting for her twenty-eight years as Director of the Indiana University Residence Halls. Lute Troutt, who is celebrating her twenty-fifth year as Director of the Dietary Department at Indiana University Medical Center, Indianapolis, was also honored.

**Iowa Dietetic Association.** On November 9, the Iowa Dietetic Association met at the State University of Iowa, Iowa City. At the business meeting reports were given of the A.D.A. meeting in Boston and of the Upper Midwest Hospital Conference held in Minneapolis in June.

The following speakers were on the program: Dr. Gerhard Hartman, Administrator, Iowa University Hospitals, who discussed "Personnel Problems"; Dr. Julian D. Boyd, Professor of Pediatrics, State University of Iowa, who reported on the progress of the Glenwood dental research project; and Lenore Sullivan, Professor of Institution Management, Iowa State College, who spoke on the basic mix preparation developed in her department. The audience was given an opportunity to sample freshly baked products made from this mix.

FOR THE
*Diabetic*



**DIET SCALES ARE BACK!**

Diet Scales save time in computing food values. Adjustable dial compensates for weight of container. Convenient to carry, easy to clean. Measures to 500 grams by 1 gram units.

**Unsweetened Fruits**
**Packed in Natural Juice**

Packed in their own juices, Cellu Juice-Pak Fruits add taste interest to meals. Food values are itemized on the labels for convenience in arranging the diet. Many popular varieties available. *Write for catalog.*

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**CELLU *Dietary Foods***
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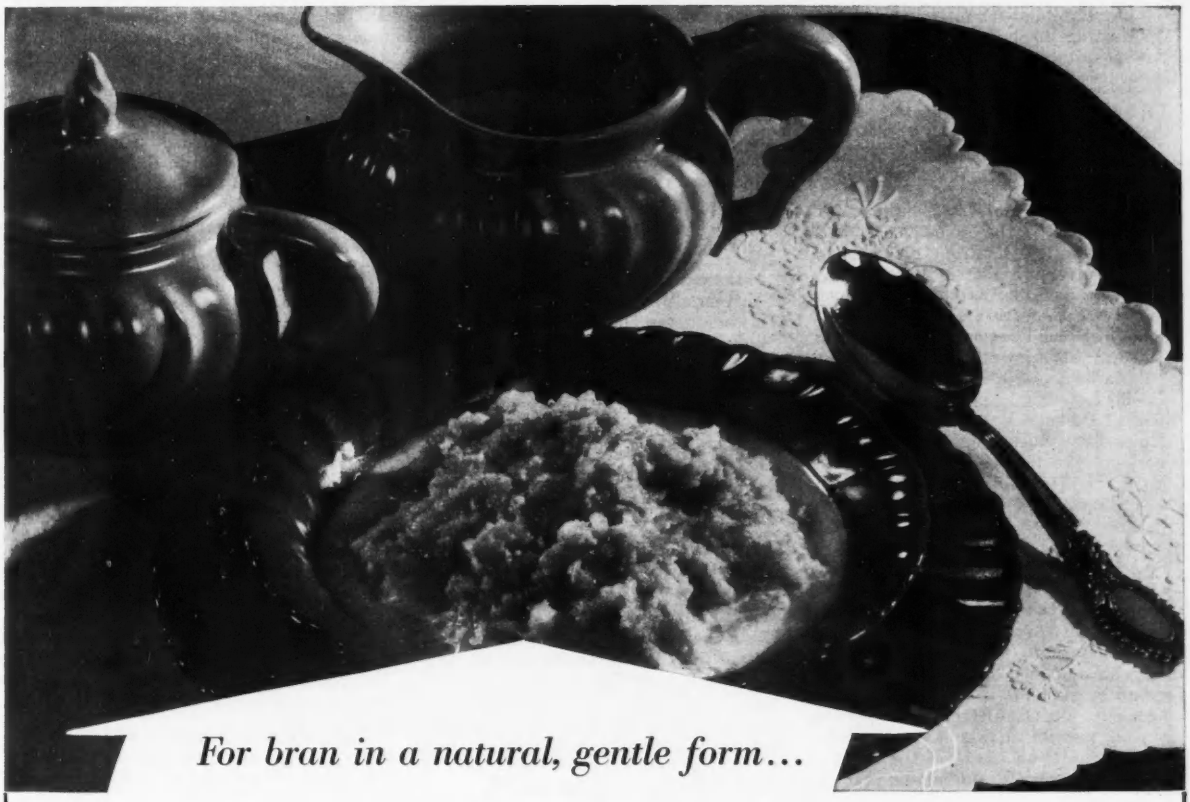

*For bran in a natural, gentle form...*

**SERVE THIS DELICIOUSLY DIFFERENT HOT FLAKED WHOLE WHEAT**

You no doubt serve Pettijohn's as many other dietitians do, to give tempting variety to breakfast menus. If so, you have found how quickly appetites respond to its flaky whole-grain texture and nut-sweet flavor.

But do you know of another unique advantage Pettijohn's offers your patients? It gives them bran as Nature intended it to be eaten —warm, moist, *gentle* bran, with the rest of the whole wheat grain, including the wheat germ.

In addition to its natural bran, Pettijohn's contains the whole grain food values of protein, minerals and B vitamins. It is made of choice plump whole wheat kernels steel-cut and flaked exactly as Quaker Oats are. Any serving of food contributing as much as 10% of the minimum daily requirements of a nutrient can be considered an excellent source of that nutrient. On this basis, a dish of Pettijohn's, served with milk and sugar, makes a real contribution to your patients' diets.

Serve Pettijohn's for whole grain nourishment, delightfully different taste and texture, and gentle natural bran. Pettijohn's cooks in less than five minutes and costs only 1c a serving.

★ ★ ★

Contribution of one serving of Pettijohn's* to the minimum daily requirements of an adult

**As served with 4 ounces of milk and sugar.*

| Nutrient | % furnished by 1 serving |
|---|---|
| Thiamin | 16.20 |
| Riboflavin | 11.60 |
| Iron | 11.60 |
| Calcium | 19.20 |
| Phosphorous | 23.00 |

**PETTIJOHN'S**... *Hot Flaked Whole Wheat*

THE QUAKER OATS COMPANY • CHICAGO 4, ILLINOIS

The Exhibit Committee prepared an interesting display of tray covers and favors suitable for various occasions for this meeting.

**Kansas Dietetic Association.** President of the new *Kaw Valley Dietetic Association* is Carol Dornan, Kansas State College, Manhattan.

**Louisiana Dietetic Association.** The fall meeting of the Louisiana Dietetic Association was held on the Louisiana State University campus, Baton Rouge, on November 13. At the morning session, Dr. Mary Speirs, Head, Department of Home Economics, Georgia Agricultural Experiment Station, spoke on "Variations in Nutritional Qualities of Foods." Other speakers were: Dr. Clara Tucker, Head, Department of Home Economics, Louisiana State University, who told of her experiences in Greece; and Cecelia Pudelkewicz, Assistant Home Economist, Louisiana Agricultural Experiment Station, who discussed the "Nutritional Status of Selected Groups of Louisiana School Children." Elva Kahrs, Chief Dietitian, Touro Infirmary, New Orleans, announced plans for the Southeast Dietetics Institute to be held in Biloxi in March. Luncheon was served to the group by students in institutional management. In the afternoon a workshop type of meeting in which section chairmen met with members of the Association to plan work for the coming year was held.

Officers for 1948–49 are: President, Irene Tolliver, Louisiana Polytechnic Institute, Ruston; President-Elect, Frances Halbert, Hotel Dieu, New Orleans; Vice-President, Beth Andrews, Louisiana State University, Baton Rouge; Secretary-Treasurer, Janet Eley, U. S. Marine Hospital, New Orleans.

**Maryland Dietetic Association.** A box-lunch supper at the Sheppard-Enoch Pratt Hospital, Towson, on September 22 was enjoyed by members of the Maryland Dietetic Association. Square dancing, led by a professional group, comprised the evening's entertainment.

On November 8 and 9, the Maryland-District of Columbia Hospital Association held its annual conference at the Statler Hotel, Washington. The Dietetic Section included as speaker Dr. Robert H. Felix, Director of Mental Hygiene Service, U. S. Public Health Service, who talked on the "Relationship of Dietetic Care and Mental Hygiene." John Bourke of the American Gas Association spoke on the latest developments in equipment. A panel discussion was entitled "What Portion of Hospital Spending Is Allocated for Dietary Service." The participants were Dr. Madison Brown, Assistant Director, Johns Hopkins Hospital; Rosalind Lifquist, Food Economist, USDA; Robert Hoyt; and Colleen C. Hambleton, Chief Dietitian, West Baltimore General Hospital, Baltimore.

Due to the resignation of Edith Jones, President-Elect for 1948–49, the officers of the Maryland Dietetic Association previously announced have been changed. The officers for 1948–49 as they are at present are: President, Mary Reinhardt, Mercy Hospital, Baltimore; President-Elect, Janette Carlsen, Johns Hopkins Hospital, Baltimore; Vice-President, Eleanor W. McCarl, Baltimore; Secretary, Sybil Bangs, West Baltimore General Hospital; and Treasurer, Colleen C. Hambleton, also of West Baltimore General Hospital.

**Massachusetts Dietetic Association.** The year's program for 1948–49 for the Massachusetts Dietetic Association has been printed in folder form. In December, the meeting was held at the Massachusetts General Hospital, Boston, with Dr. Arthur S. Keats, formerly of the U. S. Public Health Service, as guest speaker. His topic was "A Recent Nutrition Survey in Belmont, Massachusetts." At the January meeting, Mrs. Edward R. Collier, Director of Publicity, Boston University, will discuss "The Art of Plain Talk." In February, the meeting will concern vocational guidance and will be a joint meeting with the Massachusetts Home Economics Association. High school vocational guidance teachers will be invited as guests for this meeting. "How to Reduce Food Costs" will be the topic at a joint meeting in March with the New England Hospital Assembly. In April directors of schools of nursing and instructors of nursing education will be invited to be guests at a panel discussion on the A.D.A. *Manual for Teaching Nutrition and Dietetics to Student Nurses.* The May meeting will be held at the University of Massachusetts in Amherst, with two papers on the program. The first will be "Current Research Work at the University"; the second, "The Nutrition Institute of Central America" to be described by Robert S. Harris, Professor of Biochemistry of Nutrition, Massachusetts Institute of Technology.

**Mississippi Dietetic Association.** The annual fall meeting of the Mississippi Dietetic Association was held on November 4 and 5 at the University of Mississippi. Edna V. Ward, Chief, Dietetic Division, Veterans Administration, Dallas, spoke on "Dietetic Service in the Veterans Administration." An illustrated lecture on "What Is New in Institutional Cooking Equipment" was given by John J. Bourke, American Gas Association. An afternoon discussion session concerned "Coordinating the Nutrition and Dietetic Work in Mississippi." A new step forward was taken by the Mississippi Association when the first printed issue of its bulletin appeared this fall.

The new Mississippi officers for 1948–49 are President, Mary S. Harvey; President-Elect, Margaret Pettyjohn; Vice-President, Margaret Webb; Secretary, Elizabeth G. Taylor; and Treasurer, Janette Habas.

**Missouri Dietetic Association.** The annual business meeting of the Missouri Dietetic Association took place in St. Louis, November 19. Mable MacLachlan, A.D.A. Educational Director, spoke at the business meeting. Dr. Robert E. Shank, Professor of Public Health and Preventive Medicine, discussed "Appraising Human Nutrition Status," and Father Leo C. Brown of St. Louis University discussed "Labor Problems in Food Serving Establishments."

New officers of the Missouri Association are: President-Elect, Mary Harrington, Educational Director, Dairy Council of St. Louis; Vice-President, Conie Foote, Nutritionist, Midwest Branch, American Red Cross; Secretary, Loma Robley, University of Kansas City Dining Hall; and Treasurer, Virginia Daly, Division of Maternal Hygiene, Missouri State Board of Health.

**New York State Dietetic Association.** The *Junior Greater New York Dietetic Association* held its first meeting of the year on November 2 at the Veterans Hospital, Bronx. Seventy-five dietetic interns were present. The program was on the subject of personnel management. Ralph G. DeVoe, Manager, Bronx VA Hospital, talked on "Making Decisions," and Irwin H. Cohen, Chief, Personnel Relations and Training Section, at the same hospital, discussed "The Supervisor, Past, Present, and Future."

**Pennsylvania Dietetic Association.** On November 9 the regular meeting of the *Philadelphia Dietetic Association* was held at the Pennsylvania Hospital. The entire meeting was given to reports from the national convention in Boston. A comprehensive report was given on the proposed reorganization of the A.D.A. together with an interpretation of its functions, by Evelyn Carpenter, Chairman of the Pennsylvania delegates. The speaker of the evening was Anna dePlanter Bowes, President of the Pennsylvania Dietetic Association, who discussed A.D.A. affairs in terms of national and state interests. Her talk brought out the need for cooperation from every member, the need for active participation to help our national association function as an outstanding professional organization, and to make our public relations effort worthy of the expenditure and work which has gone into it.

Philadelphia observed National Diabetes Detection Week, December 6 to 11. During that week the Philadelphia Metabolic Association conducted an open forum on diabetes, December 10, at the Philadelphia County Medical Society. An exhibit of menus and recipes for diabetic patients used at the forum was prepared by the Philadelphia Dietetic Association.

**South Carolina Dietetic Association.** The twelfth annual fall meeting of the South Carolina Dietetic Association was held in conjunction with the South Carolina Home Economics Association in Columbia on November 12 and 13. Dr. S. L. Zimmerman, Chief of the Medical Service, Veterans Hospital, discussed

## CANNED FOOD TABLES

**Home Economics Division, National Canners Association, 1739 H Street N. W., Washington 6, D. C.**

## NUTRITIVE VALUES OF AVERAGE SIZE SERVINGS OF CANNED FOODS*

| FOOD | SIZE OF SERVING | | Calories | Protein gm. | Fat gm. | CHO gm. | Ca mg. | P mg. | Fe mg. | Vitamin A I.U. | Thiamine (Vit. $B_1$) mg. | Riboflavin (Vit. $B_2$) mg. | Niacin (Nicotinic Acid) mg. | Ascorbic Acid (Vit. C) mg. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Weight gm. | Approximate Measure | | | | | | | | | | | | |
| **FRUITS** | | | | | | | | | | | | | | |
| Apricots, sirup | 122 | 4 med. size halves & 2 T. sirup | 105 | .6 | .2 | 25.0 | 9.8 | 19.5 | .85 | 2,650 | .022 | .024 | .42 | 5 |
| Blackberries, sirup | 113 | ½ cup | 95 | .8 | .2 | 22.4 | 20.3 | 21.5 | 2.94 | 200 | .015 | .021 | .24 | 7 |
| Blueberries, sirup | 113 | ½ cup | 51 | .7 | .2 | 11.5 | 12.4 | 6.8 | 5.76 | 38 | .016 | .016 | .21 | 15 |
| Cherries, red, sour pitted | 113 | ½ cup | 60 | .9 | .3 | 13.3 | 12.4 | 13.6 | 3.16 | 980 | .031 | .018 | .21 | 7 |
| Grapefruit sections | 113 | ½ cup | 87 | .7 | .1 | 20.9 | 14.7 | 15.8 | .34 | 18 | .040 | .024 | .24 | 28 |
| Peaches, sirup, clingstone | 117 | 2 med. size halves & 2 T. sirup | 95 | .6 | .1 | 22.7 | 3.5 | 12.9 | .35 | 530 | .008 | .023 | .70 | 5 |
| Peaches, sirup, freestone | 117 | 2 med. size halves & 2 T. sirup | 101 | .6 | .1 | 24.3 | 4.7 | 14.0 | .35 | 390 | .009 | .023 | .64 | 4 |
| Pears, sirup | 117 | 2 med. size halves & 2 T. | 88 | .4 | .1 | 21.2 | 8.2 | 8.2 | .23 | 90 | .02 | .02 | .23 | 3 |

## SERVINGS PER UNIT FOR VARIOUS CANNED FOODS IN COMMON CAN AND JAR SIZES

| | Product | Container Size | Approximate Net Weight or Volume | Approximate Cups or Pieces | Approximate Servings per Container | Size of Each Serving |
|---|---|---|---|---|---|---|
| FRUITS | Apples; Applesauce; Berries; Cherries; Grapes; Grapefruit and Orange Sections; Fruit Cocktail; Fruits for Salad; Sliced Peaches, Pears; Pineapple Chunks, Crushed, Tidbits | 8 Z Tall | 8½–8¾ oz. | 1 cup | 2 | ½ cup |
| | | No. 2 | 1 lb. 4 oz. | 2¼–2½ cups | 5 | ½ cup |
| | | No. 2½ | 1 lb. 13 oz. | 3¼–3½ cups | 7 | ½ cup |
| | | No. 10 | 6 lb. 2 oz. to 6 lb. 12 oz. | 12–13 cups | 25 | ½ cup |
| | Apricots, Whole (Medium Size) | No. 2 | 1 lb. 4 oz. | 10–13 | 5 | 2–3 apricots |
| | | No. 2½ | 1 lb. 13 oz. | 15–18 | 7 | 2–3 apricots |
| | | No. 10 | 6 lb. 10 oz. | 50–64 | 25 | 2–3 apricots |
| | Apricots, Halves (Medium Size) | No. 2 | 1 lb. 4 oz. | 18–24 | 5 | 3–4 halves |
| | | No. 2½ | 1 lb. 13 oz. | 26–35 | 7 | 3–4 halves |
| | | No. 10 | 6 lb. 10 oz. | 93–129 | 25 | 3–4 halves |
| | Peaches, Halves (Medium Size) | No. 2 | 1 lb. 4 oz. | 9–12 | 5 | 2 halves |
| | Pears, Halves (Medium Size) | No. 2½ | 1 lb. 13 oz. | 13–16 | 7 | 2 halves |
| | | No. 10 | 6 lb. 10 oz. | 45–66 | 25 | 2 halves |
| | Pineapple, Sliced | No. 1 Flat | 9 oz. | 4 | 2 | 2 slices |
| | | No. 2 | 1 lb. 4 oz. | 10 | 5 | 2 slices |
| | | No. 2½ | 1 lb. 14 oz. | 8 | 8 | 1 slice |
| | | No. 10 | 6 lb. 12 oz. | 28–50 | 25 | 1 large or 2 small slices |
| | Plums; Prunes | No. 2 | 1 lb. 4 oz. | 9–11 | 5 | 2–3 plums |
| | | No. 2½ | 1 lb. 14 oz. | 12–16 | 7 | 2–3 plums |
| | | No. 10 | 6 lb. 10 oz. | 41–59 | 25 | 2–3 plums |
| | Figs | No. 2 | 1 lb. 4 oz. | 13–17 | 5 | 3 figs |
| | | No. 2½ | 1 lb. 14 oz. | 18–24 | 7 | 3 figs |
| VEG.—Cont'd | Beans, Baked; with Pork; in Sauce | No. 300 | 15½ oz. | 2 cups | 3–4 | ½–¾ cup |
| | | Jumbo | 1 lb. 13 oz. | 3 cups | 4–6 | ½–¾ cup |
| | | No. 10 | 6 lb. 14 oz. | 12–13 cups | 16–25 | ½–¾ cup |
| | Mushrooms | 2 Z | 3½ oz. | ½ cup | 1 | ½ cup |
| | | 4 Z | 6¾ oz. | ⅔ cup | 2 | ⅓ cup |
| | | 8 Z | 12½ oz. | 1½ cups | 4 | ⅓ cup |
| | | No. 10 | 6 lb. 7 oz. | 12 cups | 36 | ⅓ cup |
| BABY FOODS STRAINED | Infant (Strained, Homogenized) | | 4½ oz. | 9 tbsp. | | |
| | Junior (Chopped) | | 4¾ oz. | 9 tbsp. | | |
| | | | 7½ oz. | 14 tbsp. | | |
| | Infant (Strained) | | 3½ oz. | 6 tbsp. | | |
| | Junior (Chopped) | | 3½ oz. | 6 tbsp. | | |
| | Infant and Junior | | 4¾ oz. | 9 tbsp. | | |
| SOUPS | | No. 1 Picnic | 10½–12 oz. | 1¼–1½ cups | 2½ | ¾ cup ½—See footnote |
| | | No. 303 | 1 lb. | 2 cups | 3 | ¾ cup |
| | | No. 300 Cylinder | 1 lb. 2 oz. | 2½ cups | 3–4 | ¾ cup |
| | | No. 303 Cylinder | 1 lb. 5 oz. | 2½ cups | 4 | ¾ cup. |
| | | No. 3 Cylinder | 3 lb. 2 oz. | 6¼ cups | 8–9 | ¾ cup |
| | | No. 10 | 6 lb. 8 oz. | 12–13 cups | 16 | ¾ cup |
| MEATS | Chili Con Carne | No. 300 | 15½–16 oz. | 2 cups | 3–4 | ½–⅔ cup |
| | | No. 10 | 6 lb. 12 oz. | 12 cups | 20 | ½–⅔ cup |
| | Corned Beef | No. 1 | 12 oz. | | 4 | 3 oz. |
| | | No. 6 | 6 lb. | | 30 | 3 oz. |
| | Corned Beef Hash | 1 lb. | 1 lb. | 2 cups | 3–4 | ½–⅔ cup |
| | | No. 10 | 5 lb. 8 oz. to 5 lb. 14 oz. | 12 cups | 18–24 | ½–⅔ cup |
| | Deviled Ham | No. ¼ | 3 oz. | ¼ cup | 3–4 | 1½ tablespoons |
| | Deviled Meat; Potted Meat; Meat Spreads | No. ¼ | 2–3¼ oz. | ¼ cup | 3–4 | 1½ tablespoons |
| | | No. ½ | 5½ oz. | ½ cup | 8 | 1½ tablespoons |
| | Luncheon Meat; Pork Loaf | 12 oz. | 12 oz. | | 4 | 2 slices (3½" x 1¾" x ⅜") |
| | | 6 lb. | 6 lb. | | 32 | |
| | Veal Loaf | 7 oz. | 7 oz. | | 2–3 | 2 slices (3½" x 1¾" x ⅜") |
| | Tongues, Lunch | No. ½ | 6 oz. | | 2 | 3 oz. |
| | | No. 1 | 12 oz. | | 4 | 3 oz. |
| | Tongue, Ox | | 1–2 lbs. | | 4–8 | 4 oz. |
| | Hams, Whole (Small) (Medium to Large) | | 9–11 lbs. | | 20–35 | 2 slices (4" x 3" x ⅛") |
| | | | 11–13 lbs. | | 35–45 | |
| | Poultry, Chicken; Turkey; (Boned) | | 4½ oz. | | 1–2 | 3 oz. |
| | | | 6 oz. | | 2 | 3 oz. |
| | | | 11 oz. | | 4 | 3 oz. |
| | | | 2 lb. 3 oz. | | 12 | 3 oz. |
| | Sausage, Pork; Frankfurters | 8 Z | 8 oz. | 11–12 | 3–4 | 3 sausages |
| | | | 12 oz. | 8–9 large | 4 | 2 sausages |
| | Sausage | No. | 1 oz. | 8–10 | 2 | 4–5 sausages 4–5 sau- |


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Street .....

City ..... State .....

Position or School .....

congestive heart failure with special emphasis on the dietary treatment. Joe Cassidy, chemist for the Southern Gold Oleomargarine Company, talked on the "Nutritional Value of Oleomargarine."

**Tennessee Dietetic Association.** The annual convention of the Tennessee Dietetic Association was held in Nashville on November 12 and 13. Officers this year are President, Florence MacLeod, University of Tennessee; Vice-President, L. Margaret Johnson, Peabody College; and Secretary-Treasurer, Ruth Huenemann, University of Tennessee.

**Virginia Dietetic Association.** The annual fall meeting of the Virginia Dietetic Association was held on November 12 and 13 at Richmond. Speakers were: Austin E. Grigg, Professor of Psychology, University of Richmond; Carolyn Bass, Therapeutic Dietitian, Veterans Administration Hospital, Richmond; Marguerite Zapoleon, Chief, Employment Opportunities Branch, Women's Bureau, U. S. Department of Labor, Washington, D.C.

Ellasue Carr is President of the Virginia Association for 1948–49, and Elizabeth Hounds is Vice-President.

**West Virginia Dietetic Association.** The Executive Board of the West Virginia Dietetic Association met in Charleston on November 13 to discuss plans for the coming year's activities. Stress will be laid on vocational guidance and public relations. Ona Stinson, President, represents the Association on the West Virginia State Nutrition Committee. She reported that the Committee is conducting a recruiting program for prospective dietitians. By correlating the work of the two groups, a more extensive program is expected.

The *Charleston Dietetic Association* has been organized, with the following officers: President, Thelma Boomer, Herbert J. Thomas Memorial Hospital; Vice-President, Mary Boyles; Charleston General Hospital; and Secretary-Treasurer, Mary Vance, Charleston General Hospital.

## *Association Activities*

**Public Relations Honor Goes to A.D.A. Convention Speaker.** W. Howard Chase, Director of Public Relations for the General Foods Corporation, has been named "top public relations man of the year" by the Public Relations Society of America, Inc. This announcement is of special interest to dietitians since A.D.A. had the honor to present Mr. Chase as one of the speakers at the Public Relations Meeting of the A.D.A. convention in Boston, October 19. His outstanding talk at this meeting contained authoritative advice and stimulating ideas regarding the dietetic profession. The highlights of the speech follow:

"The common denominator of professional conduct for the dietitian lies in the single word: responsibility. Only when responsibility is taken seriously can a group command attention as a profession. . . . The most basic prerequisite to becoming a profession is willingness to resign—willingness to resign when certain standards are not maintained. As long as the tricks and crafts of a profession are available to the highest bidder without regard to the social consequences of their use, the abilities and aims of the entire group are being prostituted. The group is not entitled to the distinction of being called a profession.

"The three requirements for professional status are: (a) conviction—a missionary's zeal for social good; (b) curiosity—an aliveness or awareness to crosscurrents of opinion; and (c) endurance.

"All of these requirements are needed, whether the goal is freedom to become a profession or one of the other interrelated freedoms—freedom of speech, freedom of the press, the right to own property, freedom of religion, freedom of assembly, or academic freedom."

Mr. Chase closed his talk with these thoughts:

"Would we lead? Then we must be prepared to follow.

Would we influence? Then we must draw strength and direction from those whom we would influence.

"Would we be loved and respected? Then we must love and respect.

"Would we champion a cause? Then let us champion the people in their fight for great but simple goals—the physical goods plus the spiritual satisfactions."

**New Public Relations Committee.** On December 1, the 1948–49 A.D.A. Public Relations Committee held its first meeting since the Boston convention, to formulate plans for the coming year. The new chairman, Mary Katherine Brown of Cereal Institute, Inc., Chicago, and the new Co-Chairman, Mary I. Barber, formerly of W. K. Kellogg Company, Battle Creek, Michigan, met with the following members of their committee: Mary Reeves, Chairman of the Educational Exhibits Committee, and Marjorie Siler, Chairman of the Vocational Guidance Committee. Elizabeth Perry, Chairman of Public Relations in 1947–48 and now President-Elect of the A.D.A., participated in this meeting as well as representatives of the J. Walter Thompson Company and members of the A.D.A. staff.

In addition to Miss Brown, Miss Barber, Miss Reeves, and Mrs. Siler, several other A.D.A. members have been invited to assist on the Public Relations Committee. Their names will be announced in the near future.

**Contributions for Public Relations.** Since September 1, the beginning of the current fiscal year for A.D.A., four groups have sent money to help defray the costs of the A.D.A. public relations program.

The *California Dietetic Association* has sent $704—a sum based on $1 per member.

The *Michigan Dietetic Association* has donated $150, an amount equal to that contributed from Michigan in the fiscal year just past.

From the life members of A.D.A. living in *Ohio* have come $60.63.

A contribution of $25 has also been received from the *Texas Dietetic Association.*

**Vocational Guidance Kits.** This year the A.D.A. Vocational Guidance Committee has followed the same procedure as last year in sending the A.D.A. Vocational Guidance Kit to state association presidents, professional education and vocational guidance chairmen, and directors of approved internships. This kit now contains the following material:

*Dietetics as a Profession*
*Bibliography of Dietetic Careers*
Descriptive folder of A.D.A.
List of Approved Internships
Academic Requirements for Membership in A.D.A.
"Chart Your Career in Dietetics"
Outline for talks on dietetics
List of publications and reprints
Vocational Guidance Supplement 1
Vocational Guidance Supplement 2
Vocational Guidance News Letter No. 1, November, 1948

The Vocational Guidance Supplements consist of mimeographed material which was prepared last year by the Vocational Guidance Committee in conjunction with the J. Walter Thompson Company. They contain a sample talk, a sample radio script, sample news releases, and other hints for presenting the dietetic profession to the public. The News Letter, the latest addition to the Kit, contains information as to what the various state and local associations are doing to improve their vocational guidance programs.

Additional copies of the complete kit are available to local associations and to individual A.D.A. members who are interested in working on vocational guidance. The charge for the kits is $1.00 per copy and may be obtained by writing to the Association office in Chicago.

**Dietetic Exhibits at Two Conventions.** The A.D.A. exhibit featuring the manual, *A Guide to the Selection and Training of Food Service Employees*, was displayed at the annual meeting of the *School Food Service Association* held in Detroit, November 18 to 20. Margery Trott, Past-President of the Detroit Dietetic Association, took charge of the exhibit.

When the *American Vocational Guidance Association* held its annual meeting in Milwaukee, November 30 to December 4, arrangements were made for A.D.A. to present an exhibit. The display, "Dietetics as a Profession," was highlighted at the joint meeting of the Home Economics Section and the Vocational Guidance Section. Members of the Milwaukee Dietetic Association, of which Ruth Humboldt is President, attended the meeting to answer any questions regarding the profession of dietetics.